New York, N. Y., October 1, 1919 McGraw-Hill Company, Inc. Vol. XXI, No. 7. 25c a copy

CHEMICAL & METALLURGICAL ENGINEERING

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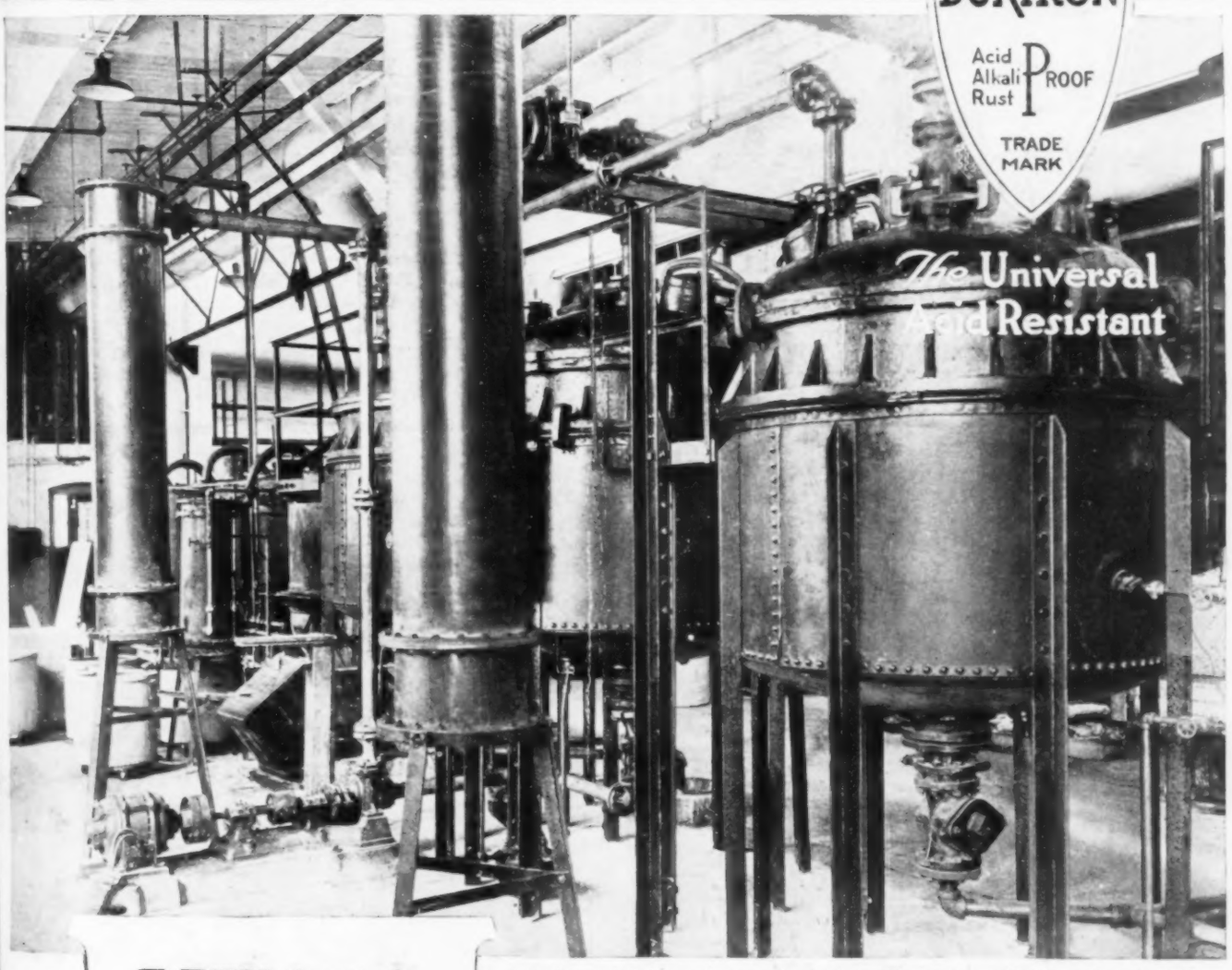

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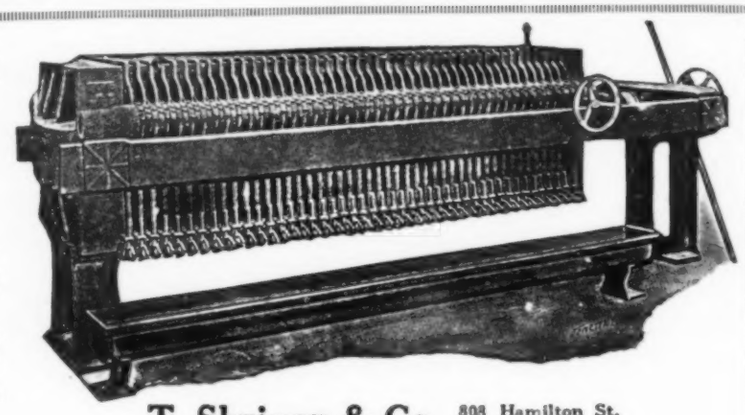

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CHEMICAL & METALLURGICAL ENGINEERING

A consolidation of
ELECTROCHEMICAL & METALLURGICAL INDUSTRY *and* IRON & STEEL MAGAZINE

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Volume 21 — New York, October 1, 1919 — *Number* 7

Announcement of Weekly Publication

BEGINNING with this issue of CHEMICAL & METALLURGICAL ENGINEERING, the magazine will be published weekly instead of semi-monthly as heretofore. The project has been under consideration for more than a year, and only unusual industrial conditions throughout the world prevented the consummation of the plan at an earlier date. We believe the step is now justified by the situation prevailing in the industries represented in our title. Not only are they more firmly established than ever before in the history of our country, but they are more vital to our eminence as a world power. There is international competition ahead not yet realized, nor will it manifest itself in full measure until the nations of Europe settle down to steady production and strike their gait. It were nothing short of the folly of unpreparedness to await that time before putting our own house in order. Progress is rapid; developments grow apace; the industries are in a state of flux. Prompt and timely presentation of the news, technical and industrial, demands more frequent publication of a magazine that presumes to act as an exponent of chemical and metallurgical engineering in the United States. In this effort to serve new as well as old established industries within their domain, American publishers are not alone. Contemporaries have recently made their appearance in England and Canada; German publishers are again active, and French technical literature is appearing in greater quantity than ever before. The need of disseminating information while it is timely and valuable is felt throughout the world. We are confident, however, that with the co-operation of our readers and contributors we can so serve our industries as to keep them not only abreast of the times but in the van of progress. To this end we have laid our plans, and to its accomplishment we pledge unlimited facilities.

The Path Of Sanity

BLASÉ indeed must be the man who can view with equanimity and unconcern the threatening aspect of the industrial situation in the United States today. With radical agitators defying their more conservative superiors, with labor unrest lowering production at a time when steady and greater production is one of the remedies of our trouble, with inflammatory speech and action prevailing where wise counsel and sober meditation was to have been expected, and with men by the hundred forsaking the paths of reason and sanity to follow after false gods, the need of wise leadership was never greater. A task is set for every patriotic American who cares to see his country escape the catastrophe that has engulfed Europe, particularly Russia and Hungary. We hold it to be the duty of every intelligent citizen to exert his influence for patience and reason, to speak wisely and inculcate sound doctrine among his associates, to discountenance violence, threats and incendiary speech, and to get clearly in his own mind the fundamental elements of the situation.

No man of vision doubts that the world is undergoing a profound change in the social order that means as much for democracy in industrial relations as the war did for democracy in government. The evidences are on every hand and found in the mouths of true leaders of Capital as well as of Labor. But it is a change that is not going to be wrought by force and violence; nor does it need to be, because the truth is appreciated by those who have the power to put it into effect. It may have been necessary for Russia to have her experience in Bolshevism, but, as Mr. HOOVER says, "it is not necessary that we of the United States, now that we have witnessed these results, plunge our own population into these miseries and into a laboratory for experiment in foreign social disease."

It is, however, necessary that we should find the proper remedy, not only for the foreign social disease but for the domestic malaise that now afflicts us and offers a tempting excuse for the agitator. Mr. HOOVER believes that this is "the paramount business of every American today," and that "we shall never remedy justifiable discontent until we eradicate the misery which the ruthlessness of individualism has imposed upon a minority." This is a sufficiently strong statement to please even a radical agitator, but it emanates from an intelligent source and carries conviction that is lacking in the catch phrases of the Reds. Labor today has the sympathetic ear of an intelligent public. The pendulum has been swinging its way for some time past, even to the detriment of Capital, and we have made more than an approach to that equality of opportunity and better distribution of production which is the ideal condition. Undoubtedly both Labor and Capital have much more to learn, and the Community has something to demand of both. In the light of the present situation, what may these things be?

In the first place, Labor must appreciate the fallacy of reaching Elysium through constant reduction of hours of employment and increase in compensation. The demoralized industrial production of Europe, particularly those parts in which the experiments of Communism have been tried, must convince even the ignorant that only disaster can follow such steps. Two years of Bolshevism have plunged the Russian people into deeper physical distress than ever they knew under

the Czar; and today, as Mr. HOOVER points out, "the very High Priest of Socialism is vainly endeavoring to save his people from their destruction by summoning back the forces of production." Russia had raw materials and labor in plenty, but in some mysterious way all were to prosper without producing. As a consequence Mr. HOOVER believes that "Socialism as a philosophy of possible human application is bankrupt," having "wrecked itself on the rock of production."

A lesson may be taken by Labor from the new spirit of the German republic. If the cabled news is to be accepted, German labor believes that only in steady and increased production lies their salvation. Nay more, they believe that it is the road to national supremacy. Consequently, we find them demanding not shorter hours, but longer; not restricted production in order that more may be employed, but unlimited production so that the people as a whole may enjoy a higher standard of living and the workers receive a larger return. It may be stated as an accepted fact that the nation which most quickly resumes normal production will occupy the strategic position in world trade, and the sooner Labor realizes this and proceeds accordingly, the better for all of us.

With wider powers and increased authority in industrial affairs, Labor must accept a new responsibility. Its wiser leaders are deprecating the use of the strike, especially among classes of public servants on whom the safety of the community depends, but there are still many agitators who would have policemen, firemen and similar workers enforce their demands with the strike. This is little short of madness, for it is but a step further to involve soldiers and sailors—and then Soviet government. If Labor cannot intuitively perceive the duty and responsibility of public servants to the community, and discountenance the formation of striking unions among them, public approval must inevitably desert the Labor cause. The Governor of Massachusetts is worthy of all commendation for his action in the Boston police strike. More power to his arm, and to all who show his wisdom and courage!

If Labor has lessons of moderation and co-operation to learn, so has Capital. First it must take the initiative in bringing about that co-operation that must exist before either party can prosper in the highest degree. Labor's demands for a share in the profits and in the management of industry are generally recognized as fair, and it is incumbent on intelligent Capital and Management to devise equitable schemes for the consummation of these ideas. As Dr. STEINMETZ once said, "there are several ways—mostly unsuccessful"; but he went on to declare that "Capital is entitled to a fair rate of interest on the money invested and Labor is entitled to a fair rate of wages for the work done. All profits beyond that belong to Capital and Labor. These should be divided as dividends on capital stock, and on labor stock as found by yearly wages. This system is in operation in a number of corporations."

As intimated before, there must be a more equitable distribution of the products of industry, and this means the abolition of profiteering and of the exorbitant profits on capital that once were regarded as perfectly legitimate even though obtained at the expense of fair treatment of the workers. If Labor's right to share in the profits of industry is being recognized, no less is its right to share in the management. Capital must recognize the fact that domination by any one element will not secure maximum production, so essential to the welfare of the Community, but that it will be obtained only by "giving a voice in the administration of production to all sections of the Community concerned in the specific problem."

All these ideas will seem idealistic to the conservative and reactionary, but they are in practical application in enough places and enough forms to know that they are fundamentally right and workable. The Community is demanding more and more that industrial conditions be established that shall relieve it of the periodical hold-up to which it is subjected by strikes and profiteering. We believe the most progressive minds of the day are confident of the future and willing to risk the application of principles of fairness and justice. We believe with LOWELL, who wrote

> New times demand new measures and new men;
> The world advances and in time outgrows
> The laws that in our fathers' day were best;
> And, doubtless, after us some purer scheme
> Will be shaped out by wiser men than we,
> Made wiser by the steady growth of truth.
> The time is ripe, and rotten-ripe, for change;
> Then let it come; I have no dread of what
> Is called for by the instinct of mankind.
> Nor think I that God's world would fall apart
> Because we tear a parchment more or less;
> Truth is eternal, but her effluence,
> With endless change, is fitted to the hour;
> Her mirror is turned forward, to reflect
> The promise of the future, not the past.

Herbert C. Hoover—American Citizen

GREAT as was the professional part played by engineers during the war, to none of them was it given in such great measure as to Mr. HOOVER to direct the economic forces that were so vital to the success of the conflict; to no other private citizen of the United States was it given to emerge from five years of arduous labor as an outstanding world figure, known, respected and honored among the nations of the earth. Small wonder, then, that the American Institute of Mining and Metallurgical Engineers took advantage of the occasion of Mr. HOOVER'S return to this country to do him honor, and at the same time bring the profession of engineering into the reflected light of his glory. His career and record are not only a refutation of the charge that engineers take slight interest in public affairs, but they exemplify the peculiar fitness and ability of the well-trained engineer for the administration of large public affairs.

It has not been uncommon for the average citizen to express surprise that HOOVER, the mining engineer, should have been so successful in the rôles he has undertaken and performed so well. That is because of an erroneous public impression of the nature and character of engineering. As was so pertinently pointed out by Mr. SAUNDERS in his introduction of Mr. HOOVER at the dinner, the modern definition of engineering is that lettered on the wall of the Engineering Societies' library in New York—"Engineering, the art of organizing and directing men, and controlling the forces and materials of nature for the benefit of the human race." In every detail Mr. HOOVER'S work of the past five years has come within the scope of the definition; men in large numbers have been organized and directed, and the forces and materials of nature have been controlled for the benefit of the human race. The combination comprises engineering, and the man who has shown ability to compass the task has proved himself in the highest degree an engineer.

A brief account of the dinner in Mr. HOOVER'S honor, and his address on that occasion are printed elsewhere in this issue. We commend a careful reading of the latter because it presents the first-hand observations and the sound judgment of an intelligent student of world problems since the Armistice.

We deem it appropriate, in the interest of straight thinking among our people, to give it as wide publicity as possible.

Fifth National Exposition of Chemical Industries

THE Fifth National Exposition of Chemical Industries, which Chicago papers called the first, opened on the minute Monday, September 22. Lack of space in the Coliseum required that the First Regiment Armory also be engaged, making it like a train in two sections.

Praise is due both to the management and the exhibitors for being ready when the doors opened.

The exhibits while growing in scope are developing a popular side. Charts showing the steps of processes were much more generally displayed. There was also a greater amount of miniature apparatus, some of which was in operation, and it was very illuminating. It was not only instructive to the curious but showed clearly the scope and requirements of a plant or department to make a given product. A noteworthy feature was that the exhibitors had learned better how to exhibit and we shall comment on this in notes on the Exposition. On the whole it was the best show that has been held and we extend to the management our felicitations.

More Power to the Bureau of Mines!

A SIGNIFICANT milestone in the history of the Bureau of Mines was passed a few days ago with the dedication of its handsome new Pittsburgh laboratories, no less a monument to the broad vision of Dr. HOLMES, the first director, and his associates than to the constancy of purpose with which their successors have built upon this foundation. Any institution which starts on a serious campaign for the conservation of life and resources in any industry truly has an ever-widening field awaiting it.

When the Bureau was first proposed more than a little opposition arose from those who failed to see where a governmental department could effectively cooperate with the mining industry without assuming dictatorial powers so disagreeable to Americans. Few indeed are the critics now remaining. Time has shown how scientific investigation by an organization with no mandatory powers but properly officered can safeguard the life of the miner and smelterman, how this organization of specialists can investigate methods of treating refractory ores, methods of winning fuels from unusual sources, methods of proper utilization of our easily-mined supplies so as to involve minimum wastage before the product reaches the hands of the consumer.

More power to the Bureau of Mines! More funds for its important investigations! More research men of highest caliber to explore mining and metallurgical byways, and more competent engineers to interpret their discoveries to the industry!

May its future be as honorable and influential as its past.

The Steel Strike An Object Lesson

THE steel strike turns the pitiless light of publicity upon policies of labor agitators that have been growing more common and connects the most reprehensible practices with the organized labor that is sponsored by the American Federation of Labor and its head, SAMUEL GOMPERS, who has been referred to in many quarters as the second president of the United States.

Something, and something big, is going to come of this. The Senate has been investigating it. The White House conference on labor to be held October 6 cannot avoid considering it. The campaign to "organize" the iron and steel industry was initiated at the annual convention of the American Federation of Labor at St. Paul in June, 1918. The organization campaign was conducted under the auspices of 24 unions, affiliated with the A. F. of L., but when the strike call was persisted in at least one of those unions withdrew and ordered its locals not to participate.

The organization campaign was directed chiefly at common labor, and was successful only with ignorant foreign-born common labor. The strike committee approached Judge GARY, chairman of the Steel Corporation, for a "conference," was refused, and approached no other manufacturer. The strike call followed, for September 22, and the first two days of the strike threw idle about one-third the iron and steel producing capacity, almost wholly because foreign-born common labor struck while other labor was intimidated.

The issue was collective bargaining and the closed shop, bargaining with labor agitators who pretended to represent men because they had collected $3 each from them, the "organizer" getting $2 commission, one of the twelve points in the organization platform being the "check-off" whereby the collection of subsequent sums, $3 or other amounts, would be made sure.

Surrender meant eventual relinquishment of practically all property rights, while no compromise ground was conceivable. The agitators might have been content with less than all at the outset, knowing that eventually they were certain to get all. The only questions therefore are of the time and hardships involved while the manufacturers win the strike and the influence these events will have upon the general labor situation. During the strike men willing to work will be prevented from working by intimidation. Consumers of steel will have their supplies curtailed, and as steel is used in almost all work, the whole country will be seriously inconvenienced. There are no stocks of steel that will help materially.

The American Federation of Labor can be held responsible for this effort to disturb a peaceful industry, on whose operation the welfare of the major part of the public is more or less dependent, to incite riot and bloodshed, for that is what it means in actual substance, and in fact to start a bolshevist revolution.

Here are two issues, the closed shop and the revolution. Mr. WILSON, years before he became President, declared himself to be "a fierce partisan" of the open shop. Let us hope he is so still. He will have much to do with conducting the deliberations of the coming White House conference on labor.

Readers' Views and Comments

A New Compensated Heatmeter

To the Editor of Chemical & Metallurgical Engineering

SIR:—In the Sept. 1 issue of CHEMICAL & METALLURGICAL ENGINEERING, a "New Compensated Heatmeter" is described by Mr. Charles P. Frey. It is the purpose of this note to call the attention of the author to the fact that the use of "heatmeter" for an instrument which is in no way used to measure quantities of heat is a misnomer and should be carefully avoided. The instrument described measures temperatures by measuring the current produced when the junction of two thermocouple wires is maintained at a temperature different from the temperature of the other ends which are joined either directly or indirectly to the instrument. The use of "heatmeter" for an instrument which indicates temperatures may not seem to some to be much of an error, but they should realize that such practice is the same as using the words "temperature" and "heat" synonymously. The proper use of these two words is one of the first things the high school boy is taught upon taking up his first introduction to the subject of heat in his elementary physics.

The author also states that an ammeter is substituted in place of a pyrometer. In fact the instrument, together with thermocouple, is only a pyrometer in which an ammeter is used to indicate the effect due to a thermo-electromotive force being maintained in a circuit instead of a potentiometer, galvanometer, etc.

If the Brown Instrument Co. wishes its instrument to make a favorable impression in the eyes of the public, it would be better to advertise it under one of the usual names or at least one that is not misleading.

T. S. TAYLOR,
Research Physicist.

Westinghouse Research Laboratory,
East Pittsburgh, Pa.

War Department Deserts Chemical Warfare Service

To the Editor of Chemical & Metallurgical Engineering

SIR:—I am enclosing herewith a copy of a letter by Prof. B. B. Freud of the Armour Institute of Technology, Chicago.[1] A copy of his original letter was sent to the Secretary of War and promptly routed through military channels to me for remark. I am also enclosing a copy of my remarks, which you are at liberty to use if you so desire.

AMOS A. FRIES,
Lt.-Col. C. W. S.

Edgewood Arsenal,
Edgewood, Md.

From: Commanding Officer, Edgewood Arsenal, Edgewood, Md.
To: Director, Chemical Warfare Service, Washington, D. C.
Subject: Accompanying correspondence of Capt. B. B. Freud.

1. Submitted herewith are my observations in regard to the attached letter from Prof. Freud to the Editor, CHEMICAL & METALLURGICAL ENGINEERING, a copy of which was forwarded to the Secretary of War.

2. Capt. Freud was commissioned a Captain, Chemical Warfare Service, without previous military experience or even training in gas warfare, on July 27, 1918. Less than a month later he sailed for France, where he was first assigned to the laboratory in Paris. The assignment was very shortly revoked and he was sent to the gas school at Hanlon Field. He comp'eted the courses there on Oct. 12, and thereafter, until the armistice, he was connected with gas experimentation at Hanlon Field. He was returned to the United States promptly when the war ended, receiving his discharge Dec. 24, 1918.

3. Capt. Freud thus had no field experience, nor did he serve long enough in France to get acquainted with the actual work of the Chemical Warfare Service. So far as known, Capt. Freud was never near the front line. He never got really acquainted with the activities of a Division gas officer, nor did he take any part whatever in the training or operations of gas troops. His case is one of the best examples that has ever come to my knowledge of the danger of "a little learning."

4. Taking in order the remarks of Capt. Freud, we find him first referring to gas masks. The best answer to his questions as to why the study of chemicals for gas masks should not be under chemists and physicists and why the production of finished masks should not be under the Ordnance Department is to ask why the study of diseases and their cure should not be under chemists and physicists and not under the Medical Department, or why the manufacture of medicines, surgical instruments and other implements used by the medical profession should not be under the Ordnance Department or the Corps of Engineers.

5. That sort of thing is exactly what was tried in chemical warfare, in the beginning of the war, and found to be an utter failure. When I was made Chief of the Gas Service in France the various activities now under the Chemical Warfare Service were subdivided among the Corps of Engineers, the Medical Department and the Ordnance Department, respectively, while for research and experiment it was necessary to deal directly with the Bureau of Mines in the United States. Before my assignment an officer of the Medical Department had been given broad powers under which to act on gas matters, and yet we were getting no masks, no training and no decision on gases to be used or shells or bombs in which to put them. Indeed we were getting no action on anything concerning chemical warfare in the field.

6. Everybody's business was nobody's business, as usual. No one had any special interest in chemical warfare or incentive to do anything beyond absolutely necessary routine. If there be any reason in Capt. Freud's remarks, why should not the Veterinary Corps be charged with the care of our sick and wounded and the cost of a highly trained medical profession be eliminated? In other words, Why specialists? Why the Armour Institute of Technology? Why not have all its work done in high schools or in any other place than a special institute?

7. Next, Capt. Freud speaks on gas training and classes it as "a purely military matter." He goes on to state that it should be a part of the line officer's work. Yes, why not? Why not do away with all officers and let the Army be run entirely by non-commissioned officers? That would be vastly cheaper and simpler and would do away with a host of grades and organizations. Capt. Freud closes his remarks in regard to training by stating that: "Certainly scientists are not necessary

[1] Prof. Freud's letter has been published in CHEM. & MET. ENG. vol. 21, No. 6, Sept. 15, 1919, p. 274.

for this duty.'" Let us see. I finally put at the head of gas training in France none other than Prof. G. N. Lewis (Lieutenant-Colonel, C. W. S.), head of physical chemistry, University of California, and one of the ablest and best known physical chemists in the world. I did this after two regular officers had been tried in the position and had failed. Col. Lewis succeeded because of his wide knowledge of chemistry, to which was added a highly trained mind with great vision and wonderful capacity to realize the possibilities of gas and the best methods of combating it.

8. Does not Capt. Freud know that the thoroughly trained gas officer needs a wider knowledge of all military tactics, of meteorology and of the topography of the battlefield than any other officer? Does he not realize that the weather, the woods, the knolls, the ravines, the wind and the sun must be taken into account not only with gases in general, but with each gas in particular? If this is not a job for specialists, then there is no need on earth for specialists.

9. Can your line officer be expected to acquire such knowledge or ability when rifle practice, hand-grenade throwing, machine-gun firing, and all the other multitudinous details that are required to make a highly efficient officer command all and more than all of his time?

10. Capt. Freud speaks also of the necessity of somebody writing a text on "Military Gases" of the same general character as Weaver's "Military Explosives." Weaver's "Military Explosives" was an excellent book in its day, but it is now out of date. Military gases and gas tactics of 1917 were out of date in 1918. Those of 1918 will be out of date in 1920. If we do not keep up with research, development, manufacture and training in gas, we, too, will be out of date, and *God pity us in the next war!*

11. Capt. Freud states that the offensive use of gas is largely an artillery problem and then suggests that gas troops might be put under the Engineers. This shows Capt. Freud's complete ignorance of the field of usefulness of gas troops. He apparently is not aware that the first regiment of gas troops was raised under the Corps of Engineers, and what happened? They were put on road work following the beginning of the Marne offensive and only relieved after their Colonel begged that they be given a chance to clean out German machine-gun nests that were killing our boys by the hundreds. This and other work they did so successfully that the General Staff, A. E. F., increased the gas companies to be used in the campaign in the spring of 1919 from 6 to 54; that is, the Staff increased them to nine times their original strength.

12. Capt. Freud believes that there should be a soldier-chemist on the staff of each Division. We had them, so far as possible, in the last war, but we also had three other officers, and each one of the four was kept busy to the absolute limit of his ability to cover the various requirements of the Commanding General concerning chemical warfare—and chemical warfare was only in its infancy.

13. Capt. Freud sums up and says it seems to him that the proper activities of the Chemical Warfare Service can be apportioned among the different Departments of the Army. Unquestionably, so might the activities of the Armour Institute be divided up among the country schools of Illinois. Unquestionably, if we wanted to revert to former weapons, we could abandon all organizations and modern forms of warfare, and hence all technical services, and go back to the old short Roman sword—the deadliest weapon of warfare ever invented by man. Considering the highly complicated nature of gases and the need of research, experimentation, development and manufacture, it would be just as reasonable to state that the work of our colleges could be divided up among the country schools and the college done away with as to divide the proper work of the Chemical Warfare Service among other Departments of the Army.

14. In simple words again, Why specialists at all? As stated in the beginning, Capt. Freud furnishes the finest example I have ever known of the danger of "a little learning."

AMOS A. FRIES,
Lt. Colonel, C. W. S.

Glucinum

To the Editor of Chemical & Metallurgical Engineering

SIR:—With reference to the article on Glucinum, published in CHEMICAL & METALLURGICAL ENGINEERING, Sept. 15, 1919, page 353, the use of the name Glucinum instead of Beryllium has been brought to my attention as needing some elucidation.

Since the publication of the first memoir by Vauquelin in 1798, to which is appended the editor's note using the word Glucine as the technical name of the Terre de Béril, there has been published a voluminous series of papers on "Glucinum or Beryllium" and "Beryllium or Glucinum" and it seems that the Gordian knot is not yet cut. French technical literature uses exclusively the names Glucine (from γλυκύς, sweet, as one of the characteristic properties of its salts is a sweet taste) and Glucinium as analogous to alumine and aluminium. The Germans translated Terre de Béril to Beryllerde, and they have their analogies: Beryllerde-Beryllium and Thonerde-Aluminium. In consulting the indices of the technical literature printed in English, one will find sometimes under Beryllium, "see Glucinum," and quite as many times under Glucinum, "see Beryllium."

Without going into the details of the printed discussions as to a proper name for this "chameleon element",[1] it may be sufficient to state that when I used the word Glucinum I was aware of the existence of practically all that is written on this subject.

Dr. Charles L. Parsons strongly advocates the name Beryllium, giving as the two reasons, priority and usage,[2] and sides with the "ninety and nine"[3] who are using this term, although some time before 1905 the American Association on the Spelling and Pronunciation of Chemical Terms did recommend the term Glucinum.

With the French it is not only a matter of priority and usage, but also that the sound of Glucine and Glucinium is far more harmonious and more expressive than Terre de Béril and Bérillium, and this no doubt deserves to be taken into consideration when new words are to be created. With the Germans, on the other hand, it is strictly a matter of *magister dixit*. The translator of Vauquelin's memoir used Beryllerde in 1798 and Wöhler in 1828 wrote about Beryllium, *ergo* Beryllerde and Beryllium must be as immutable as Tonerde[4] and Aluminium. With the English-speaking technical

[1] Dr. J. Emerson Reynolds, *Chemical News*, July 9, 1883, p. 9.
[2] Dr. Charles L. Parsons, *Science*, Dec. 9, 1904, pp. 809-810.
[3] Dr. Charles L. Parsons, *Science*, Feb. 17, 1905, p. 273.
[4] Some changes have been made a few years ago in the German chemical nomenclature. Among these: The name Thonerde, which stands for Al_2O_3, is now Tonerde.

man the use of Glucinum or Beryllium is, in the great majority of cases, determined by his *alma mater*.

Some writers favor Beryllia, because the use of Glucina (French, glucine), GlO, might lead to its being confused with glycine, $C_2H_5NO_2$. It is a fact that the sounds of the French *u* and *y* in glucine and glycine are hardly distinguishable to those who are not indigenous and with a chemical education, and still the Frenchmen use exclusively Glucine. The Germans and the English-speaking people cannot claim that such an argument favors their choice of Beryllerde or Beryllia.

As to whether the English and American technical men shall use Beryllium in preference to Glucinum, I submit the following important authorities: *Journal of the Chemical Society*, London, and *Chemical News* both index Glucinum and not Beryllium (See *J. Chem. Soc.*, bound vol. 114, 1918, etc., and *Chemical News*, bound vol. 109-110, 1914, etc.); Bulletin 624, U. S. G. S., describes the mineral Beryl as a Glucinum-Aluminum silicate; the Van Nostrand Chemical Annual, 1918, uses Glucinum, and only in a few places is the word Beryllium mentioned and then only in parentheses after the word Glucinum; the Chemist's Pocket Manual, 1918, uses Glucinum; lastly, the Condensed Chemical Dictionary, edited by the editorial staff of the *Chemical Engineering Catalog*[5], just issued (September, 1919), indexes on page 104 "Beryllium; see Glucinum," on page 243 "Glucinum (Beryllium)," and on page 503 "Glucinum."

In conclusion I will quote what Professor James Lewis Howe stated about 15 years ago: "With French, English and Americans using 'Glucinum,' we can afford to let the Germans cling to 'Beryllium' a little while longer."[6]

J. S. NEGRU.

New York City.

Western Chemical and Metallurgical Field

Potash Salts

NO ACTION has as yet been taken by the Ways and Means Committee regarding the bill to license potash importations. Rather the opposite—in order to provide the necessary additional potash needed this fall by the agricultural industry in addition to that produced from American sources, a recent Executive order opens the door to potash regardless of the fact that it may have been produced in Germany.

Whether the German or Alsatian supplies are sufficient for our needs remains to be seen. Conditions in Germany as regards potash are in an uncertain and disorganized state. There are no large quantities of potash available for export to this country, labor conditions are uncertain, the mines are wholly run down, transportation difficulties are many, and the coal shortage has been acute for some time. Shipping facilities are also in an uncertain condition. For these reasons, the Bureau of Mines states, the quantity of potash which may be expected to come out of Germany this fall is hard to estimate. The general director of the Potash Syndicate believes that Germany may be able to supply all the potash salts needed of the lower grades, provided boats are secured.

In addition to these uncertainties, there is also the question of what the national policy of Germany with regard to potash will be. There may be heavy taxes placed on the export of potash to raise revenue.

In Alsace it is reported that on the first of July there were from 15,000 to 20,000 tons, but that this was largely needed for domestic use. It has been estimated by H. S. Gale that there may be available during the next year, that is, up to the middle of 1920, 50,000 tons of pure potash from Alsace and an equal quantity from Germany, which together would not be nearly enough to satisfy our pre-war requirements. It is reported that the accumulated stocks of Nebraska potash have all been sold.

[5]The Condensed Chemical Dictionary, 1st Ed., 1919, the Chemical Catalog Co., Inc., New York.

[6]*Science*, vol. 21, Jan. 6, 1905, p. 36.

Alpha-Naphthol and Xylidine Mixture as Flotation Agent

The annual report of the Consolidated Coppermines Co. contains interesting information as to the results obtained in its concentrating operations during the past year and a half. Previous to Sept. 1, 1918, a coal-tar composition consisting of a mixture of coal-tar, coal-tar creosote and No. 80 Pensacola pine oil was used in the flotation cells. Since that date a mixture of alpha-naphthol and xylidine in an alkaline circuit has been used with very encouraging results. The concentrating ratio has been increased from 14.68 to 17.0 to 1, and the moisture content of the filter cake reduced from 17.15 per cent to 9.39 per cent. The increased cost of reagents from 7.46c. to 15.6c. per ton milled was more than offset by the decrease in freight and smelter charges of more than half and by a threefold increase in the capacity of the filter presses. In summarizing the results, H. S. Munroe states that the "operations for the year demonstrated that with a 1.4 per cent copper millhead and with a properly designed and operated mill the following results may be obtained:

"First: A concentrate containing 18 per cent copper may be produced.

"Second: The iron, sulphur and insoluble content may be governed within such limits as to permit of smelting this material with less than 20 per cent of barren flux.

"Third: The moisture of this concentrate may be held at 10 per cent or less."

A tabulation shows a comparison of results with the coal-tar float reagent and the X-cake reagent.

COAL-TAR REAGENTS

	Per Cent Copper	Oz. Gold	Oz. Silver	Per Cent SiO_2	Per Cent Al_2O_3	Per Cent Fe	Per Cent CaO	Per Cent S
Analysis mill heads	1.186	0.018	0.059	87.1	1.5	3.5	2.1	2.1
Analysis mill tails	0.277	0.009	0.039	91.5	1.1	2.2	2.2	0.5
Analysis concentrates	13.623	0.140	0.329	27.3	7.2	20.9	1.3	22.9
Percentage recovery	78.22	52.95	38.11	2.14	32.81	40.84	4.24	75.65

Concentration ratio, 14.68 into 1.
Per cent H_2O in concentrate, 17.15.
Cost float reagents per ton milled, 7.46 cents.

X-Cake–Xylidine Reagents

	Per Cent Copper	Oz. Gold	Oz. Silver	Per Cent SiO_2	Per Cent Al_2O_3	Per Cent Fe	Per Cent CaO	Per Cent S
Analysis mill heads	1.336	0.019	0.07	85.9	2.5	3.7	2.5	2.5
Analysis mill tails	0.206	0.006	0.04	90.1	2.3	2.1	2.6	0.5
Analysis concentrates	18.33	0.210	0.436	13.5	4.5	27.6	0.3	32.1
Percentage recovery	82.31	69.30	40.34	0.97	12.02	46.61	0.64	80.79

Concentration ratio, 17.00 into 1.
Percent H_2O in concentrate, 9.39.
Cost float reagents per ton milled, 15.6 cents.

War Risk Insurance

The Bureau of War Risk Insurance advises that it is prepared to furnish a special service in regard to war risk insurance, allotment and compensation matters. Replies to questions on these subjects will be furnished within 48 hours.

Mining Engineers Honor Hoover

HERBERT C. HOOVER was the guest of honor at a dinner given by the American Institute of Mining & Metallurgical Engineers at the Waldorf-Astoria, New York City, Tuesday evening, Sept. 16. The event commemorated his return to private life after 5 years of arduous service in administering the food supplies of many nations and participating in the economic readjustment of Europe after the Armistice. Over 1200 members of the Institute responded to the opportunity to honor their eminent fellow engineer, and the occasion was one not often paralleled, if equaled.

In the course of the evening those present were presented with a photograph of Mr. Hoover which had been provided by the committee on arrangements.

President Horace V. Winchell opened the exercises with a brief tribute to the ability and genius of the guest of honor, who has shown us that "the biscuit is mightier than the bomb." President Winchell then read letters and telegrams from various organizations and individuals, all paying tribute to Mr. Hoover's work. These messages came from: Brussels University, Robert W. Hunt, H. A. Garfield, J. C. Branner, American Engineers in London, Messrs. Honnold and Shaler, Institute of Mining & Metallurgy, Commission for Relief in Belgium, L. D. Ricketts, Members of the A. I. M. E. in London, Van H. Manning, Belgian Society of Engineers and Manufacturers of Brussels, John Hays Hammond, Trustees of Stanford University, Charles T. Neal, D. W. Brunton, Charles M. Schwab, the Commonwealth of California, Joint Council of San Francisco Engineering Societies and Henry M. Howe.

President Winchell then introduced W. L. Saunders, past president of the A. I. M. E., who acted as toastmaster. Mr. Saunders repeatedly evoked applause and cheers by his reference to the work and character of Mr. Hoover, and when he made reference to the fact that men like Hoover "are, by education and experience, best fitted to steer the ship of State" he brought the entire audience to its feet with cheers of approval for the evident political import of the remark.

Mr. Hoover responded with a brief expression of gratitude for the honor shown him and then delivered a formal address on some of the impressions gained during his service in Europe since the armistice. This address we deem of sufficient importance in these trying times to reproduce in full.

Mr. Hoover's Address

I have been asked to speak to you on some of the impressions that I have gained during my service in Europe since the armistice. Two convictions are dominant in my mind. The first comes from contact with stupendous social ferment and revolution in which Europe is attempting to find solution for all its social ills by practical experiments in Socialism. My conviction is that this whole philosophy is bankrupting itself from a startling quarter in the extraordinary lowering of productivity of industrial commodities to a point that, until the recent realization of this bankruptcy, was below the necessity for continued existence of their millions of people. My second conviction is older but has been greatly hardened, and that is a greater appreciation of the enormous distance that we of America have grown away from Europe in the century and a half of our national existence, in our outlook on life, our relations toward our neighbors, and our social and political ideals. The supreme importance of this Americanism neither permits us to allow the use of this community for experiment in social diseases, nor does it permit us to abandon the moral leadership we have undertaken of restoring order in the world.

Economic Exhaustion Rampant

During the last ten months I and my colleagues have occupied a unique position in intimate witness of the social currents that have surged back and forward across Europe. The enemy collapsed not only from military and naval defeat but from total economic exhaustion. In this race to economic chaos the European Allies were not far behind. By this exhaustion the whole of Europe stood facing a famine, the like of which has not been seen since the Thirty Years' War, when a third of the population died of starvation. In the midst of all this was the struggle of a score of new democracies to establish themselves, with friction along every frontier, and with the destruction of governmental institutions, without financial resources to buy supplies, with the miseries of their people offering fertile soil for every economic patent medicine and for all the forces of disorder, and Bolshevism and anarchy overhanging all, there could be no hope of restoring normal economic life until the completion of peace. In all this situation, with its desperation, greed, century-old animosities, its idealistic and proper aspirations, there was only one hope. That hope, expressed by every city and state, was that the American people, being the one disinterested and uncrippled economic and political force still existing in the world, should again intervene. It was in response to this call that the President, comprehending the real heart of the American people, intervened in Europe a second time and took those steps which resulted in a practical economic organization of Europe, pending the consummation of peace and the arrival of the forthcoming harvest.

Problem of the Second Intervention

This second intervention was not a relief problem in the ordinary acceptance. It was not a problem alone of finding foodstuffs for starving populations of the ravaged regions. It was the problem of finding a large margin of foodstuffs and other supplies for the whole of Europe—Allies, liberated peoples, neutrals, and enemies; and in a mass of at least 200 millions of these people formerly under enemy domination it was a problem of finding absolute economic rehabilitation. Further than this, it was a problem of warding off Bolshevism on one side and reaction on the other, in order that the new-born democracies could have an opportunity of growth. Its practical consummation was a problem of the organization of the economic strength of the United States and its co-ordination with the remaining economic strength of Europe, and, in large areas, the imposition of absolute dictatorship over economic forces.

Thus, the shipping of the world required sufficient co-ordination to transport thirty millions of tons of supplies from all quarters of the globe to Europe. It required the provision of credits to those countries whose total exhaustion abolished all hope of normal payment. It required the insistence upon payment from those who had gold or commodities. It required sufficient co-ordination of purchase in this vast quantity of

supplies that the markets of the world should be affected in the least possible degree. With the dissolution of the organization of the old channels of communication, river craft and railway rolling stock was hoarded by each state; telegraph and postal communications were broken down; every frontier was the scene of more or less military friction, until at one moment there were twenty-five little wars in progress. Many of these new governments were without experience or even without the existence of departments for the conduct of either the transportation or distribution of supplies.

Thus, it was necessary to secure the erection within their governments of actual departments, to furnish them advisors, to take over the actual operation of thousands of miles of disintegrated railway systems, to open rivers and canals for traffic, to stimulate the production of coal and other primary commodities, to control their distribution through large areas, to find a basis for exchange of surplus commodities from one state to another, to exercise the strongest political pressure to obtain the disgorgement of surpluses into areas of famine, to resort to barter on a national scale where currencies had broken down, to stimulate peoples discouraged and disheartened to efforts in their own salvation, and, finally, but not least, to intervene a charitable hand in the saving of their children and the stamping out of contagious diseases, and through all of this economic disorganization to inspire the maintenance of order on one hand and the defeat of reaction on the other. Beyond this again, the necessity of constant friendly intervention in frontier quarrels to prevent the starting of more wars.

Co-ordination Solved the Problem

These things have not been solved by the service or direction of any one man. They have been accomplished through co-ordination of the men of good will in twenty governments of Europe and throughout by creation of a thread of American personnel, directed from a single center. On our side it has required the co-operation of Congress, the Grain Corporation, the Treasury, the Shipping Board, the Army, and the Navy. A thousand Americans were sent into those communities with but little authority beyond their own assurance and the confidence on all sides that they were disinterested, that their only desire was to solve a great and human emergency for no political and no commercial advantage. It was our desire to do this from the background, without ostentation; to act at all times through established institutions, to build up their strength for the time they must rely upon their own resources. I cannot pay enough tribute to all these thousand Americans, many of them engineers, men taken from the common life of the United States, thrust into the face of staggering political, economic problems, the solution of which must affect the well-being not of hundreds but of millions. The proof of their performance lay in the fact that Europe has come through the most terrible period of its history with no loss of life from economic causes, with a stronger democracy and a glow in its heart for the United States.

This service of the American people has been accomplished at no mean national sacrifice. From the armistice to this year's harvest there has been furnished over two and a quarter billion dollars' worth of supplies, the majority of which has been given freely upon the undertaking of the assisted governments of repayment at some future date. There has been no demand of special security; no political or economic privileges have been sought. It may be years before we receive any return from these loans, but if that period should never come the American people, by this second intervention in Europe, have saved civilization, and have done so with no thought to the burden or cost to themselves. These matters have been brought to a successful close with the arrival of the harvest and the prospect of peace. What the future has a right to demand from us in further economic support is not yet clear, but it is at least certain that if the world cannot quickly secure the settlement of peace and safeguards for the future through the League the whole of our two great interventions will have gone for nothing, and the menace of reaction will again return against us upon the winds of chaos.

Common People's Condition Improving

As the executive head of this Allied effort in economic control, I have thus had an intimate contact with the common people and their officials. I have witnessed their improving physical condition, the constant change of currents of social, political and economic forces, their revolutions, and I have had to deal ultimately with the results of all these phenomena. During this period since the armistice, we have witnessed social and political revolution among one-third of the civilized world, and we see the remainder in great social tribulation. No contemporary can properly judge or balance the relative volume of great currents of social agitation. They are matters of mind and not of matter. Yet practical statesmanship requires that within our abilities a constant accounting should be taken of the tangible results of these forces abroad, if the development of our liberal institutions and progress of orderly government is to be maintained and revolution avoided.

This cataclysm of social change in Europe is the result of the long culmination of social as well as political wrongs; it is no sudden afterthought of war. These forces were projected into actual realization by the collapse of the war, the breakdown in the political institutions that had preceded it, and the misery that has flowed from it. Our soil is not so fertile as that of Europe to many of these growths, because we have a larger social conscience. We have not the vivid class and economic distinctions of Europe, nor have we the depth of misery out of which these matters can crystallize. Nevertheless, in these days of intimate communication, social forces are rapid in their penetration and social diseases are quick in universal infection.

The general revolution of Europe of the last century, starting with the French Revolution, profoundly changed the whole social order of the world, and, while in that revolution the spiritual impulse was the demand for political liberty, there was also a great economic impulse. That economic impulse was primarily the division of the land, and one of the fruits of that revolution was the better distribution of wealth among the agricultural population. Since that time an enormous expansion of mechanical industrialism has been superimposed upon all agricultural states, with a large increase in urban populations. The economic impulse of the revolution to-day is the demand for a better division of the wealth from this industrialism, and this time the agitation arises mainly from the urban population.

These vast masses of humanity in Europe have long been groping for the method of nearer equality of

opportunity and better distribution of the results of industrial production. These gropings and these attempts have in recent years been dominated by Marxian Socialism, developed in different degrees of intensity. Broadly, these revolutions have taken two forms: the Bolshevik form, through which there has been overnight communization of all property, and second, the milder form of legislative nationalization of industry. I believe we are now in position to take some stock of and to form some judgment as to the adequacy of these solutions for what I believe every liberal-minded man believes is a necessity—the better division of industrial production.

Europe's Industrial Production Demoralized

We require only a superficial survey to see that the outstanding and startling economic phenomenon of Europe today is its demoralized industrial production. Of the 450 million people in Europe, a rough estimate would indicate that they are at least 100 million greater than could be supported on the basis of production, which has never before reached so low an ebb. Prior to the war, this population managed to produce from year to year but a trifling margin of commodities over the necessary consumption and to exchange for supplies from abroad. It is true that in pre-war times Europe managed to maintain armies and navies, together with a numerically small class of non-producers, and to gain slowly in physical improvements and investments abroad, but these luxuries and accumulations were only at the cost of a dangerously low standard of living to a very large number. The productivity of Europe in pre-war times had behind it the intensive stimulus of a high state of economic discipline, the density of populations at all times responded closely to the resulting volume of production. During the war, the intensive organization of economy and consumption, the patriotic stimulus to greater exertion and the addition of women to productive labor, partially balanced the diversion of man-power to war and munitions. Both the pre-war and the war impulses have now been lost, and the productivity of Europe has steadily decreased since the armistice.

It is true that some of this diminution in production has been contributed to by the other factors, but in the larger degree the cause of this steady decrease of productivity, with its shortage of necessary supplies and its rising cost of living, must be sought in the social ferment, with its continuous imposition of Socialistic ideas. In this ferment the advocates of Socialism or Communism have claimed to alone speak for the downtrodden, to alone bespeak human sympathy, and to alone present remedies, to be the single voice of Liberalism.

We may examine these phenomena a little more closely. In Russia we have a great country in which the population, with the exception of a small minority, were comparatively well fed, warmly clothed, and warmly housed. They were subject to the worst of political tyranny, were deliberately steeped in ignorance and superstition, yet their productivity was sufficient to enable them to provide these primary comforts and to export more foodstuffs than the United States. Socialism was brought in overnight at the hands of a small minority of intellectual dilettantes and criminals, and this tyranny of minority, more terrible even than the old, has now had nearly two years in which to effect the conversion of the wicked competitive system into the Elysium of Communism. Today two-thirds of the railroads and three-fourths of the rolling stock that they control are out of operation. The whole population is without any normal comforts of life and plunged into the most grievous famine of centuries. Its people are dying at the rate of hundreds of thousands monthly from starvation and disease. Its capital city has diminished in population from nearly two million to less than 600,000. Prices have risen to fantastic levels. The streets of every city and village have run with the blood of executions, nor have these executions been confined to the so-called middle and upper classes, for latterly the opposition of the workmen and farmers to this regime has brought them also to the firing squad in appalling numbers.

Communism Acknowledging Failure

If we examine the recent proclamations of this group of mixed idealists and murderers, we find a radical change in their economic and social ideas. They have abandoned the socialization of the land, for they find the farmer will not produce for payment in high-flown and altruistic phrases. They have re-established a differential wage in an attempt to stimulate the exertion and ambition of skilled labor. They have established a State Savings Bank, in order to stimulate production through making provision for family and old age. They are offering fabulous salaries for men capable of directing the large agencies of production. In fact, while in the midst of flowery verbal endeavor to maintain that they are still Socialists, they are endeavoring to restore individual ownership of property and of the results of labor. The very High Priest of Socialism is today vainly endeavoring to save his people from their total destruction by summoning back the forces of production. The apologists of this debacle are telling us that it is due to the Allied blockade, and to various other oppositions, but any one with a rudimentary knowledge of Russia knows that they did have within their borders ample supplies of food, coal, oil, wool, flax, cotton, and metals and the factories with which to work them in abundance, and that their sole deficiency is human effort.

We could take another example of Bolshevism in the efforts of Bela Kun and his colleagues in Budapest. The distinction between this situation and Russia is that they were dealing with a population of much higher intelligence, of much higher average education, and it required but three months for the working people of Budapest to realize the fearful abyss into which they had been plunged. It was solely due to the efforts of the trade unions in Budapest that the Bolshevists were thrown out of Hungary.

These are the extreme points where Socialism has had its opportunity for immediate and wholesale application, according to all of the precepts of its advocates. Elsewhere in Europe Socialism has proceeded through established institutions, and we may shortly examine the results here also.

During the war large measures were taken on both sides of the front to secure the mobilization of production and distribution to its maximum use in the struggle. There was effective socialization of vast sections of industry. These measures are being continued and extended today in many places by governments anxious to maintain the stability of institutions, even at the sacrifice of economic safety, but under the threat of minorities of revolutionary action. Yet

here again the same prime weakness has proved itself. The only partial success of these measures in war was due to the great patriotic impulse of war. Those who conducted these large operations were men whose initiative and capacity had been selected by the competitive system. These war impulses have been lost, and these organizations with constantly decreasing efficiency even in war now face disaster from further reduced productivity. All these decreases have immediate results in a rising cost of living or the necessity of governments to subsidize commodities—such as bread. There is no better example of this than the coal industry of Europe, and even omitting Russia, this production has fallen from a rate of 600 million tons per annum at the armistice to a rate of 450 million tons recently.

The coal industry is in modern life the very life-blood of the state, and it has proved itself the most susceptible among all the industries to these influences, and its production today is at such an ebb as to jeopardize the entire social fabric. I am convinced that the greatest proportion of European leaders of Socialism today to some extent realize this bankruptcy, and are today endeavoring to cover a retreat with loud complaints as to the failure from other causes. Nevertheless, the realization itself is a great step and is bringing the turn of the tide, and through it Europe is on the road to economic recovery—if she gets peace.

Primary Conception of Socialism Wrong

The whole of these various sorts of Socialism are based on one primary conception, and that is that the productivity of the human being can be maintained under the impulse of altruism and that the selection of the particular human for his most productive performance can be made by some superimposed bureaucracy. Their weakness is the disregard of the normal day-to-day primary impulse of the human animal, that is, self-interest for himself or for his family and home, with a certain addition of altruism varying with his racial instinct and his degree of intelligence. They fail to take into account, also, that there is but one sufficiently selective agent for human abilities in that infinite specialization of mind and body necessary to maintain the output of the intricate machinery of production, and that is the primary school of competition.

My emphatic conclusion is, therefore, that Socialism as a philosophy of possible human application is bankrupt.

Although Socialism has now proved itself with rivers of blood and suffering to be an economic and spiritual fallacy and to have wrecked itself on the rock of production, I believe it was necessary for the world to have had this demonstration. Great theoretic and emotional ideas have arisen before in the world's history and have, in their bankruptcy, deluged the world with fearful loss of human life. A purely philosophical view might be that these experiences are necessary to humanity, groping for something better. It is not necessary, however, that we of the United States, now that we have witnessed these results, plunge our own population into these miseries and into a laboratory for experiment in foreign social diseases.

Bankruptcy of the Socialistic idea, however, does not relieve us from the necessity of finding a solution to the primary question which underlies all this discontent. That primary question is the better division of the products of industry and the steady development of higher productivity. This bankruptcy of the Socialist idea should, if reaction is to be prevented, return the guardianship of this problem from the radical world to the liberal world of moderate men, working upon the safe foundations of experience.

Solution of American Issues in an American Way

The paramount business of every American today is this business of finding a solution to these issues, but this solution must be found by Americans, in a practical American way, based upon American ideas, on American philosophy of life. A definite American substitute is needed for these disintegrating theories of Europe. It must be founded on our national instincts and upon the normal development of our national institutions. It must be founded, too, upon the fundamental fact that every section of this nation, the farmer, the industrial worker, the professional man, the employer, are all absolutely interdependent upon each other in this task of maximum production and the better distribution of its results. It must be founded upon the maximum exertion of every individual within his physical ability and upon the reduction of waste both nationally and individually. We can well see a vivid confirmation in Europe of the fundamental economic principle that the standard of living and the cost of living is the direct quotient of the amount of commodities produced; that we must secure a maximum production of the industrial machine if we wish to keep our population alive or if we wish to see an increase in the standard of living of our people. From this only can arise the very foundations of the higher activities of life. The application of this proposition must, however, stand several tests. A maximum production can only be obtained under conditions that protect and stimulate the physical and intellectual well-being of the producer. We shall never remedy justifiable discontent until we eradicate the misery which the ruthlessness of individualism has imposed upon a minority.

If I were thinking aloud I would say at once that this maximum production cannot be obtained without giving a voice in the administration of production to all sections of the community concerned in the specific problem; that it cannot be obtained by the domination of any one element. I would say that the human race had increased its standards of productivity and therefore of living through the growth of extraordinarily intricate organization of production and distribution based upon stimulation of the individual by the reward it offers. I would also say that it cannot be obtained from the destruction or sudden disturbance of this delicate and intricate organization of production and distribution or extravagance in its products. I would say the road lies along the better division of the more exorbitant profits that arise from these processes and that have accumulated from them. By better division of profits, I do not refer particularly to profit-sharing schemes but to the broad issue of the whole social product. Some are comparatively overpaid, and many comparatively underpaid, for the service they render to the community. Our organization in many aspects is not all that we could desire, but it is the best we have been able to evolve over thousands of years, and the destruction of these processes or of the organization which conducts them has been demonstrated to be the sure road to destitution and fearful loss of life.

It is not that we today have suddenly awakened to this necessity for better distribution of profits. The social conscience of this country has been manifesting itself continuously concerning this matter for years. We have in the United States today a better division of wealth and a greater equality of opportunity than any other nation in the world, and we have thus better foundation upon which to build. We have reason for discontent in the fact that our industrial development has outrun our social progress, and we have reason to hasten those measures that lead to larger justice in distribution of these profits, larger representation of all elements of the community in the control of these agencies to further strengthen our measures for the restraint of economic domination by the few and for the liquidation into the hands of the many of the larger industrial accumulations in the hands of the few that our rapid development has made possible.

Again I wish to repeat, the observation of these forces in Europe has reinforced my Americanism during these last ten months of intimate contact with them; it has revealed to me the distance of our departure from the political, social, and economic ideals of Europe. There has grown in this United States a higher sense of justice, of neighborly service, of self-sacrifice, and, above all, a willingness to abide by the will of the majority in every section of this community. This Americanism is the guarantee of the ability of our people to solve this most momentous internal problem confronting our generation. But these very ideals, this very sense of justice and service for our own people, gives us still further opportunities.

Our sister civilization in Europe is today recovering from a great illness. The many new democracies that we have inspired are striving for our ideals. We alone have the economic and moral reserve with which to carry our neighbor back to strength. To do this is also true Americanism.

During the evening Mr. Hoover was presented with an illuminated testimonial, a copy of which follows:

To

HERBERT HOOVER

THE Members and Guests of the American Institute of Mining & Metallurgical Engineers, assembled to commemorate his return home, extend the ***Welcome*** due an eminent American Citizen, a successful Engineer, a Genius of Constructive Administration, a practical Economist, a Statesman of World Vision.

In him they honor an Idealist who was able to vitalize the Altruism of America and save from Hunger and Anarchy vast areas of Europe where millions of men, women and children in a score of languages lift their voices to call him blessed.

He is loved and honored for his gift of leadership and inspiration which called many thousands of volunteers to his aid in the great tasks he undertook and accomplished.

Realizing that no gift of gold or precious stones could convey the deep feeling of appreciation we wish to express, we simply subscribe our names as fellow engineers, co-workers and admiring friends.

The World's Merchant Marine Tonnage

Lloyds Register for 1919-20, issued in August, shows that the world's total merchant tonnage is now 50,919,000 gross tons, compared with 49,090,000 gross tons in 1914, just before the outbreak of the European war. The totals of the steam gross tonnage in round numbers of the principal countries for the two years are separately stated. The 1919 steam tonnage for Germany is for the time of the armistice, and as Germany ceded to the Allies all ships over 1600 gross tons and from one-fourth to one-half of the remaining smaller ships, the actual German tonnage will be about 700,000 gross tons, and 2,550,000 gross tons will be divided among the Allies proportioned to war losses. Sail tonnage (net) comprises a small and diminishing part of the world's shipping and is added in at the end of the three columns following:

Countries	June, 1914 Gross Tons	June, 1919 Gross Tons	Increase (+) or decrease (—) Gross Ton
United Kingdom	18,892,000	16,345,000	—2,547,000
British Dominions	1,632,000	1,863,000	+ 231,000
United States:			
Seagoing	2,027,000	9,773,000	+7,746,000
Great Lakes	2,260,000	2,160,000	— 100,000
Austria-Hungary	1,052,000	713,000	— 339,000
Denmark	770,000	631,000	— 139,000
France	1,922,000	1,962,000	+ 40,000
Germany	5,135,000	3,247,000	—1,888,000
Greece	821,000	291,000	— 530,000
Holland	1,472,000	1,574,000	+ 102,000
Italy	1,430,000	1,238,000	— 192,000
Japan	1,708,000	2,325,000	+ 617,000
Norway	1,957,000	1,597,000	— 360,000
Spain	884,000	709,000	— 175,000
Sweden	1,015,000	917,000	— 98,000
Other countries	2,427,000	2,552,000	+ 125,000
Total steam tonnage	45,404,000	47,897,000	+2,493,000
Sail tonnage (net)	3,686,000	3,022,000	— 664,000
Grand total	49,090,000	50,919,000	+1,829,000

An Engineering Course for College Professors

A banquet in the officials' dining room marked the closing of the annual summer course for engineering teachers at the East Pittsburgh works of the Westinghouse Electric & Manufacturing Co. Eleven college professors, representing institutions all the way from Brooklyn, N. Y., to Tokyo, were in attendance.

The course just completed was of a month's duration and was composed of inspection trips throughout the plant, observation of work, and of lectures and talks by the various experts of the company. A feature introduced at the lectures was the motion picture to portray the work of modern electricity. Two of the reels of the most interest were "A Romance of the Rails" and "A Trip Through the 74th Street Power House." The "Romance of the Rails" showed the advance in present-day railroading by electrification of steam roads and the passing of steam as motive power. The trip through the power house exhibited the 70,000-kw. turbine of the Interborough Rapid Transit Co. of New York City. This turbine, which was built and installed by the Westinghouse company, is the most powerful engine in the world.

The professors who were in attendance at the summer course and the institutions they represent are: M. P. Cleghorn of Iowa State College, W. D. Emerson of the University of Maine, R. S. Howell of the Georgia Institute of Technology, L. J. Hodgins of Maryland State College, J. E. Lear of the University of North Carolina, B. K. Northrop of Cornell University, S. Noda of the Imperial University of Japan, C. W. Piper of Purdue University, J. W. Shuster of the University of Wisconsin, A. F. Puchstein of the Ohio State University and E. B. Wood of Pratt Institue.

International Union of Pure and Applied Chemistry

THE July meeting of the Interallied Chemical Confederation[1] in London was devoted to the adoption of the statutes of the International Union of Pure and Applied Chemistry.

Previous to adjournment the Conference officially appointed members of its own body as their representatives, to attend the Brussels meeting of the International Research Council on July 22, for the purpose of effecting the union of the new international chemical organization with the International Research Council as its chemical branch, and for the purpose of making such necessary alterations in the statutes which have been adopted as might become necessary in uniting with the International Research Council.

The meeting at Brussels was largely engaged in the discussion, modification and final adoption of the statutes of the new International Union of Pure and Applied Chemistry. These statutes are printed herewith as finally adopted to conform with the statutes of the International Research Council, by and of which the International Union of Pure and Applied Chemistry was constituted the chemical section, in conformity with the resolutions adopted at the London meeting.

Statutes of the International Union of Pure and Applied Chemistry[2]

Article I

1. Each of the following countries—Belgium, United States of America, France, United Kingdom of Great Britain and Ireland, and Italy, through the agency of its National Research Council (Chemistry Division), or its Federal Council of Chemistry, or failing such national federation, through the agency of a national chemistry association, joins with the others in the formation of an International Union of Pure and Applied Chemistry, having for its objects the following:

(*a*) To cement among the allied peoples the bonds of friendship and mutual esteem which have been developed and strengthened during the course of the war.

(*b*) To organize permanent co-operation between the chemical associations of the different countries.

(*c*) To co-ordinate their scientific and technical activities.

(*d*) To contribute to the advancement of chemistry in all its branches.

2. The Union thus constituted shall be perpetual. Its provisional headquarters shall be in Paris.

Article II

1. The conditions governing the admission of a country to the Union shall conform to those fixed by the statutes of the International Research Council.

2. A country may join the Union through its "national chemical federation," e.g., through its National Research Council (Chemistry Division), or through its Federal Council of Chemistry, or failing such organization, through a national association representing chemistry.[3]

[1] See CHEM. & MET. ENG., vol. 21, No. 5, Sept. 1, 1919, p. 234.

[2] This is a free and unofficial translation of the French text. A committee was appointed to prepare an authorized English version.

[3] TRANSLATOR'S NOTE.—The purpose of this paragraph is to provide for the formation in each country of some national agency which shall federate all of the major chemical organizations of the country. Thus in the United States this federation is effected through the Chemistry Division of the National Research Council, while in England it is effected through their Federal Council of Chemistry. Ultimately it is expected that in each country the federating agency will become merged in the National Research Council of that country in the capacity of its Chemistry Division.

Article III

1. The functions of the Union as set forth in Article I shall be exercised through a Council, assisted by an Administrative Secretary and by a special staff or bureau, the establishment and duties of which shall be determined by international agreement among the constituent countries.

Article IV

1. The annual subscription for each country is fixed at a rate dependent upon the number of its inhabitants, in accordance with the following categories:

	Population in Millions of Inhabitants	Minimum Annual Subscription, Francs
Category A	Less than 5	500
Category B	From 5 to 10	1,000
Category C	From 10 to 15	1,500
Category D	From 15 to 20	2,000
Category E	From 20 to 30	2,500
Category F	More than 30	3,000

2. The inhabitants of any non-self-governing colonies or protectorates of a country may, at the discretion of that country and in accordance with its own census data, be counted with its own inhabitants.

3. No member of the Union may without its own consent be assessed by the Union to provide funds for other than general administrative expenses.

Article V

1. Any member of the Union may withdraw therefrom, provided said member shall have fulfilled all of its current obligations.

2. A member of the Union may be expelled or dropped from membership by a three-fourths vote of the members of the Council, either present or represented, for non-payment of the minimum annual subscription or for a serious offense, the member having previously been called upon to furnish explanations.

Article VI

1. The Union shall be administered by a Council composed of the delegates of the constituent countries, the members and distribution of such delegates to be determined by the categories of Article IV in accordance with the following table:

	Delegates		Delegates
Category A	1	Category D	4
Category B	2	Category E	5
Category C	3	Category F	9

2. These delegates shall be appointed for a term of three years by the "national chemical federation" of the respective countries. One-third of the membership of the Council shall retire annually but the retiring members shall be eligible for re-appointment.

Article VII

1. The executive functions of the Council shall be exercised through a committee of the officers, which shall be a president, four vice-presidents, and a general secretary. These officers shall be elected by the Council from among its own membership by a majority vote. They shall serve for terms of three years and, with the exception of the general secretary, shall not be eligible for immediate re-election to the same office. The president shall be chosen from among the vice-presidents.

Article VIII

1. The Council shall meet at least once a year on the day before the annual general meeting in the town where the latter is to be held, and in addition as often as it shall be convened by its president, or upon the requisition of one-fourth of its members.

2. The Council shall fix the date and place of meeting, draw up the budget, and decide as to expenses.

3. Resolutions shall be adopted by a majority.

4. On questions of an administrative or financial nature the voting shall be by countries, each country having a number of votes equal to the number of its delegates. In such voting it is, however, not necessary that all these delegates be present. The delegates of any country may appoint one or several proxies to represent them and to vote in their name.

5. Voting by correspondence is permitted.

6. All questions to be voted upon must appear on the agenda of the meeting.

7. The president shall have the casting vote in case of a tie.

Article IX

1. Minutes shall be kept of all meetings. Two copies of the minutes shall be prepared and signed by the chairman and the secretaries of the meeting.

2. The permanent secretarial staff shall have the custody of the archives, and shall be entrusted with the execution of the decisions taken by the Council and by the committee of officers and in particular with the circulation of the agenda.

Article X

1. The functions of the committee of officers shall be:

(*a*) To see that the rules are strictly observed.

(*b*) To prepare the agenda for meetings of the Council.

(*c*) To record and carry out the decisions of the Council.

(*d*) To perform during the entire period elapsing between two meetings of the Council the necessary acts of administration and to report the same in writing to the members of the Council.

(*e*) To submit to the Council a yearly budget draft.

(*f*) To represent the Union or to appoint its representatives.

Article XI

1. There shall be instituted, in addition to the Council, a consultative committee, consisting of as many sections as shall be necessary to insure the complete representation of pure and applied chemistry in conformity with the regulations of the Union.

Article XII

1. The General Assembly of the Union shall consist of the members of the Council and of the delegates of the "national chemical federation" of the constituent countries.

2. A regular meeting of the General Assembly shall be held at least once a year, preferably at the time and place of the meeting of the International Congress of Pure and Applied Chemistry.

3. The General Assembly shall also meet when called together by the Council or when such meeting is requested by at least one-half of the members of the Union.

4. The General Assembly shall receive reports on the administrative work of the Council, on its financial situation, and on the general condition of the Union.

5. It shall approve the accounts of the previous fiscal year as certified by an auditor, selected from outside the membership of the Council and appointed by the General Assembly of the preceding year.

6. It shall pass upon the budget for the next fiscal year and shall discuss those questions appearing upon its agenda.

7. The annual report and the financial statement shall be sent each year to all the members three months in advance of the annual meeting of the General Assembly. The agenda of the General Assembly shall be drawn up by the Council and must include every question which shall have been transmitted to it by any of the members of the Union three months in advance of the meeting of the General Assembly.

8. The officers and executive committee of the General Assembly shall be identical with those of the Council.

9. Votes on administrative and financial questions shall be cast by countries, each country having the number of votes indicated in the categories of Article VI.

10. The delegates of any country may appoint one or several proxies to represent them and to vote in their name.

Article XIII

1. All expenditures shall be authorized by the president and disbursed through the administrative secretary.

2. The spokesman and representative of the Union before the public and in all legal matters and court proceedings shall be its president, who may, however, delegate his powers in this respect to the administrative secretary or to any member of the Council.

Article XIV

1. Resolutions of the Council relating to such purchases, exchanges and transfer of real property as may be needed for the accomplishment of the objects of the Union, grant of mortgages on the said properties, leases for more than 9 years, transfers of properties and loans, must be submitted to the General Assembly for approval.

Article XV

1. Amendments to these statutes may be considered and voted upon by the General Assembly only when submitted thereto by the Council of the Union or proposed by a "national chemical federation" of one of its constituent countries. All such proposed amendments shall appear upon the agenda of the meeting of the General Assembly, provided they have been received in writing by the committee of officers at least three months in advance of the meeting.

2. Voting upon amendments shall be by countries in accordance with the categories of Article VI.

3. Voting by correspondence is permitted.

4. The statutes may be amended only by a two-thirds majority of the votes cast.

Article XVI

1. In the event of a meeting of the General Assembly being convened to decide upon the dissolution of the Union, special notices to that effect shall be sent three months in advance; and at least three-quarters of the members of the Union or their proxies must be present. If this proportion is not reached, the General Assembly shall be adjourned for not less than six months, when the decision of the adjourned meeting shall be operative, irrespective of the number of members present.

In any case, dissolution can only be resolved upon by a majority of two-thirds of the votes cast.

Article XVII

1. In the event of dissolution the General Assembly shall appoint one or more trustees to liquidate the property of the Union; and any surplus assets shall be donated to an international institution.

Article XVIII

1. In the interpretation of these statutes the French text shall be authoritative.

Eighth Annual Safety Congress

THE National Safety Council will hold its Eighth Annual Safety Congress at the Hotel Statler, Cleveland, Oct. 1 to 4, 1919. During the week of the Congress, the people of Cleveland will endeavor to excel the record established by St. Louis in its "Safety Week" last year. They have undertaken a difficult task, for the achievement of St. Louis was remarkable. In that city during Safety Week there was only one death from accident (an intoxicated man killed in falling from a wagon), whereas during the previous week there were ten accidental deaths and during the corresponding week of the previous year there were twenty-four. But the enterprising spirit of Cleveland recognizes no limitations in a great humanitarian work of this kind. Every man, woman and child in the city will be on the alert to prevent accidental injuries during the special campaign. Every factory, every school, every home, all the educational and social forces in the entire community will be enlisted in one great life-saving effort. The goal is *no accident* during Congress week. A large clock on the Cleveland Trust Co. building near the Hotel Statler will register the record each day.

TIME-TABLE OF MEETINGS

Sessions	Wednesday Oct. 1	Thursday Oct. 2	Friday Oct. 3	Saturday Oct. 4
Registration	9: a.m.			
Annual Meeting of Members	10:00 a.m.			
Directors' Meeting	5:00 p.m.			
Executive Committee Meeting		5:00 p.m.		
Reception and Informal Dance	9:00 p.m.			
Informal Dinner and Smoker		7:00 p.m.		
Banquet (Informal)			7:00 p.m.	
GENERAL SESSIONS:				
Employees' Representation	2:00 p.m.			
Americanization		2:00 p.m.		
Health			2:00 p.m.	
Safety Education				2:00 p.m.
ROUND-TABLES:				
General Round-Table		8:00 a.m.		
A,B,C, Session		9:30 a.m.		
Employees' Benefit Associations			9:30 a.m.	9:30 a.m.
Employees' Publications		12:30 p.m.		
Bulletins			12:30 p.m.	
SECTIONAL MEETINGS:				
Automotive		9:30 a.m.	9:30 a.m.	
Cement		9:30 a.m.	9:30 a.m.	
Chemical		9:30 a.m.	9:30 a.m.	
Construction		9:30 a.m.	9:30 a.m.	
Electric Railway		9:30 a.m.	9:30 a.m.	
Health Service			9:30 a.m.	9:30 a.m.
Local Council Officers			9:30 a.m.	9:30 a.m.
Marine and Navigation				9:30 a.m.
Metals		9:30 a.m.	9:30 a.m.	9:30 a.m.
Mining		9:30 a.m.	9:30 a.m.	9:30 a.m.
Packers		9:30 a.m.	9:30 a.m.	
Paper and Pulp		9:30 a.m.	9:30 a.m.	
Public Safety			9:30 a.m.	9:30 a.m.
Public Utilities			9:30 a.m.	9:30 a.m.
Rubber				9:30 a.m.
Steam Railroad		9:30 a.m.	9:30 a.m.	9:30 a.m.
Textile		9:30 a.m.		
Women in Industry		9:30 a.m.	9:30 a.m.	
Wood-working			9:30 a.m.	9:30 a.m.

EXHIBIT—Opens Monday, Sept. 29, 8:00 p.m. Open daily 11:00 a.m. to 11:00 p.m. Grays' Armory. Closes Saturday 6:00 p.m.

The following papers will be presented at the sessions of the Chemical Section, of which E. H. Fiesinger, safety engineer, Solvay Process Co., is chairman:

THURSDAY MORNING

9:30—"Supervision of the Chemical Industry From the Point of View of Accidents and Occupational Diseases," Dr. Alice Hamilton, United States Bureau of Labor Statistics, Washington, D. C.

10:15—"Lead Poisoning and Its Prevention," C. P. Tolman, chairman manufacturing committee, National Lead Co., New York City.

11—"Dangers in the Manufacture of Dyes," Dr. L. C. Cone, National Aniline & Chemical Co., Buffalo, N. Y.

FRIDAY MORNING

9:30—"The Controlling Factors in Gas Mask Design," Dr. W. K. Lewis, Massachusetts Institute of Technology, Cambridge, Mass.

10:15—"Some Experience in Accident Prevention in the Dye Industry," A. H. Massey, E. I. du Pont de Nemours & Co., Wilmington, Del.

11—"The Failure of Materials Due to Chemical Action," E. G. Rippel, sales manager Buffalo Foundry & Machinery Co., Buffalo, N. Y.

The Metals Section will hold three sessions, at which the following papers will be read:

THURSDAY MORNING

9:30—"Accident Prevention in a Malleable Iron Foundry," H. L. Church, Rockford Malleable Iron Works, Rockford, Ill.

10:15—"The Personal Element in a Safety Program for the Foundry," M. F. Gartland, Marion Gray Iron Foundry Co., Marion, Ind.

11—"Safety in the Steel Foundry."

FRIDAY MORNING

9:30—"Consider the Crane," C. C. Rausch, assistant director Safety Institute of America, New York City. Discussion by O. J. Lewis, McKinney Steel Co., Cleveland, Ohio.

10:15—"New Ways to Put Safety Across in a Steel Plant," H. P. Weyne, United Alloy Steel Corporation, Canton, Ohio. Discussion by H. W. Darr, Cambria Steel Co., Johnstown, Pa.

11—"Practical Demonstration of Investigating Accidents," court of inquiry staged by H. J. Weeks with employees of American Steel & Wire Co.

SATURDAY MORNING

9:30—"How the Foremen Cut Lost Time Accidents," James F. Belford, acting secretary of labor, safety and welfare, American Smelting & Refining Co., New York City. Discussion by E. E. Judd, American Smelting & Refining Co., Omaha, Neb.

10:15—"Humanizing a Steel Plant," Philip Stremmel, superintendent hot mills, National Enameling & Stamping Co., Granite City, Ill. Discussion by Raymond G. Adair, safety engineer, American Rolling Mills Co., Middletown, Ohio.

11—"Practical Demonstration of Welding and Cutting," J. Schleicher, the Alexander Milburn Co., Baltimore, Md. (All present to have welding goggles furnished by various manufacturers.)

The Safety Exhibit to be shown at Grays' Armory will be unquestionably the most pretentious and elaborate ever shown in America. Practically all of the leading manufacturers of safety devices will be represented. This feature of the Congress will be presented under the joint auspices of the National Safety Council and the Safety Institute of America.

The exhibit will be opened at 8 o'clock, Monday evening, Sept. 29, and will be open thereafter between 11 a. m. and 11 p. m. daily. It will close Saturday, Oct. 4, at 6 p. m.

The exhibit will be open free to the public. Workingmen and their families are especially invited to view the exhibits in the evening of any day during Congress week.

Chicago Exposition and Conventions

EVERY available space was filled in the great Coliseum, in which the Chemical Exposition was held in Chicago. The first impression on looking down from the gallery was that the main floor exhibits were divided into three sections by aisles.

The combined exhibit along the center aisle made by the General Chemical Co., the Barrett Co., the Semet-Solvay Co. and the National Aniline & Chemical Co. struck a new note in technical exhibitions by calling in the art of the architect in structural design and interior decoration and that of the artist in paint. Every detail was worked out with artistic feeling and understanding and the insignia of the Chemical Warfare Service were used with charming effect. The services of Arthur Covey, a sound painter, were availed of, and along the walls we found very decorative panels of the interior of a dye house and of a synthetic color works. A picture of Herreshoff furnaces in operation with heaps of Spanish pyrites to balance the composition in general challenged the eye to closer inspection, and it did all this unconsciously. Art pays.

The Official Opening

It is curious how we are tied to conventions. In olden days when royalty visited a city the Mayor appeared in his robes of office and welcomed their Highnesses, pledging the constant devotion of the people, then serenity would respond in appreciation. When we have a convention or exposition nowadays we go through a similar performance. It is doubtful if the good people of Chicago were anxious to show their Mayor, and consequently on the opening of the Exposition the Governor of Illinois was to have made the address of welcome and our colleague, Dr. C. H. Herty, editor of the *Journal of Industrial and Engineering Chemistry*, was to have responded, but the one was in Washington and the other in Europe, so Chairman Redman of the Chicago Section bade all welcome and Manager Roth responded with felicity.

Exhibits of Small-Scale Apparatus a Feature

The miniature and small-scale apparatus shown are features of the exposition. The Raymond Impact Pulverizer Co. had mills of several sizes in operation, the Dorr Co. showed its thickener and the General Bakelite Co. had a molding machine for making pressed beakers of Bakelite, the Redmanol Chemical Products Co. did similar work with Redmanol, making cigar and cigarette holders. The Industrial Filtration Corp. showed a rotary vacuum filter with which they separated diatomaceous earth. Other small units in operation included a Jewell still, a Proctor cotton drier and exhibit of the Philadelphia Drying Machine Co. Maurice A. Knight of Akron showed in operation a miniature acid pumping system that occupied hardly more than one cubic foot of space and the General Ceramics Co. exhibited a complete nitric acid plant in miniature but not operating.

Industrial Charts

Making charts has become not only an art but a fashion. The coal tar chart of the Barrett Co. was considerably amplified over that of last year. The U. S. Industrial Alcohol Co. showed another of alcohol and the American Cyanamid Co. exhibited its raw materials and all products in sequence. The Hooker Electrochemical Co. began with salt and water which it treats with electricity derived from Niagara Falls power and showed all its products. The Technical Association of the Pulp and Paper Industry gave a similar graphic representation of the making of paper. The New Jersey Zinc Co. exhibited Franklin ore and the various steps in making each product, ending with white rubber goods and objects in brass and zinc.

Not exactly in the form of a chart but nevertheless well displayed were the products of Shawinigan Falls, Quebec: Calcium carbide, acetylene, acetaldehyde, and acetic acid. In the same booth the Shawinigan Electro Metals Co. had an exhibit of magnesium and its uses, particularly as a deoxidizing agent as an alloy with aluminum to improve its strength, density, machining qualities, finish and polish.

Mining Engineers

The first day of the meeting of the Institute was marked by a large registration and several technical sessions. The boat trip scheduled for Gary, Indiana, was definitely postponed on account of the steel strike and arrangements were made to hold the meetings in Chicago. The smoker on Monday evening was one of the best affairs of its kind ever held. George H. Rice, chief mining engineer of the Bureau of Mines, and Dr. F. G. Cottrell, assistant director, both of whom have recently returned from France, gave illustrated talks of their trip.

Chicago a Busy Host

The prospects for successful meetings of five of the leading American scientific and technical societies are excellent in spite of the unsettled industrial conditions. Chicago never before entertained so many scientific and engineering bodies in one week, and while it afforded an unusual opportunity for meeting men from all parts of the country the general consensus was that there was an undesirable congestion of such functions that should be avoided in the future if possible.

Borax in Searles Lake Potash

Investigation by the Department of Agriculture, it is stated officially, has developed that the potash put on the market by one of the companies operating on Searles Lake contained an injurious amount of borax. The investigation has not proceeded far enough to determine the character of the output of others operating in the same area. The salts which were examined showed an average of 10 per cent borax. Some samples went as high as 23 per cent borax, the Department states. The Bureau of Soils is in receipt of numerous complaints of crop injury resulting from the use of Searles Lake potash. The Bureau has satisfied itself that injury to crops will result when a sufficient amount of borax is applied with the potash.

Research Problems Before the Bureau of Standards

A total of $440,000 for research work and materials is carried in the first deficiency appropriation bill, which just has been taken up by the House of Representatives. Industrial research calls for $250,000 of the appropriation; testing government materials, $100,000; industrial safety standards, $25,000; standardization of instruments, $50,000, and the purchase of platinum for laboratory use, $15,000. The money is to be expended by the Bureau of Standards.

International Exposition of Mining Industries

The permanent exhibit of mining and metallurgical machinery planned by the Merchants and Manufacturers Exchange of New York[1] will open on Dec. 1, at Grand Central Palace.

One entire floor will be devoted to machinery, appliances, supplies and products pertaining to metal mining, non-metal mining, coal mining and the production of petroleum. Other floors will be devoted to other permanent expositions and exchanges of interest to engineers, such as material handling machinery, general machinery, factory appliances, municipal equipment and farm tractors and implements. Mr. Howard R. Ward, manager of the Exposition, who has recently returned from a trip through the West, reports widespread interest on the part of manufacturers and engineers interviewed. Some are especially attracted by the possibility of opening up business in foreign countries, some are considering it from a purely advertising standpoint, while others are planning to use the Exposition as their Eastern office or as an adjunct to their New York office.

The value of this centralized Exposition is readily appreciated. To the buyer it will be a center where he can accomplish the bulk of his purchasing in a short space of time, without traveling all over the country. To the manufacturer it will be a point of contact with the buyer. To the engineer it will be a center where he not only can study "standard practice" but will be able to see new devices and methods. New York is the logical point to which operators and engineers come to interest capital. Grand Central Palace will become the most convenient central point to which engineers, mine operators and purchasers will bring those whom they wish to interest financially.

New Headquarters for A. S. T. M.

The executive committee of the American Society for Testing Materials announces that the establishment of headquarters in the building of the Engineers' Club of Philadelphia, 1315-17 Spruce Street, forecast in its annual report to the Society, is now assured. It had become increasingly evident during the past year that the growing activities of the Society required an expansion which is not possible at the University of Pennsylvania, where the headquarters have been maintained under most pleasant and advantageous conditions since the incorporation of the Society in 1902.

The headquarters will be on the third floor of the building, where extensive alterations are now being made which will enable the Society to maintain very suitable headquarters.

The new headquarters are centrally located and convenient to the principal hotels and railway stations. The Engineers' Club is affliated with the Philadelphia sections of many of the national engineering and technical societies, and is the center of engineering activities in Philadelphia. An auditorium on the second floor of the building, with a seating capacity of 125, and a committee room in the Society's headquarters will offer very satisfactory facilities for meetings of the committees of the Society. Out of town members may use the Society's headquarters as their mailing address while in Philadelphia, and facilities will be provided in the Society's rooms for correspondence.

[1]See CHEM. & MET. ENG., vol. 21, p. 121, Aug. 1, 1919.

Bill Providing for Research on Oil Shales

Convincing reasons why the Bureau of Mines should undertake experiments looking to the commercial development of petroleum from oil shale have been presented to the Senate Committee on Mines and Mining. The committee recently took up the consideration of a bill by Senator Henderson of Nevada providing $140,000 for such an investigation. The committee referred the bill to the Secretary of the Interior for his report. Mr. Lane submitted a lengthy review on the oil shale situation which he closed as follows:

"Experimental work must necessarily precede such a large undertaking as the development of the oil shale industry, and I recommend that such work start now so that at the time when the supply of petroleum from our wells does not meet the essential demands, then the oil from shale will be ready to alleviate partially this shortage. Favorable action by Congress upon such a measure as S. 2671 will help to bring about the desired results."

Civil Service Examinations

The following examinations are announced:

Metallurgist.—Vacancies exist in the Ordnance Department at Large for duty at manufacturing plants within the United States, at $3400 to $3600 a year. Closes Oct. 7, 1919.

Research Operator-Metallurgical.—The register of eligibles will be divided into two grades, Grade I, $1500 to $2000 a year, and Grade II, $2000 to $2500 a year. After six months' satisfactory service in Grade II, appointees will be eligible for promotion to Grade III, in which the salaries range from $2500 to $3000 a year. The duties of these positions consist of work in connection with research projects, either ferrous or non-ferrous, on ordnance materials. Although originally announced for Aug. 12, it is understood that it will be re-opened for another sixty days.

Physicist, Qualified in Optics.—The duties will consist of the supervision of the work of the optical division of the Bureau of Standards. Salary, $3600 to $4000. Oct. 14, 1919.

Minerals Relief Commission Resumes Work on Claims

The Shafroth Commission has returned from a visit to twelve cities, during which testimony was taken in 500 cases. The Commission came back with a clearer understanding of the situation and is prepared to dispose of claims rapidly from this time on. It is admitted by the Commission that the limitations of the act work injustices in numerous cases, and it is probable that the Commission will be requested, in the light of its experience, to suggest amendments to the act which will make it more equitable. Nevertheless, the Commission will dispose as rapidly as possible of the claims which clearly fall under the act as it now stands, allowing the other claims to await possible legislation looking to changes and liberalization of the law.

The National Pyrites & Copper Co. of Georgia has been awarded $37,000 in full payment of its claim. The company asked $189,723.43. This is the second award to be made, the first being that of the Chestatee Pyrites & Chemical Co., which was given $219,607.90. The company claimed $914,172.73. A third decision denied the claim of J. N. Lotspeich of Morristown, Tenn., who asked reimbursement for expenditures made in efforts to interest capital in certain manganese properties.

Meeting of the Rubber Division, American Chemical Society*

By Andrew H. King

THE recent meeting of the Rubber Division of the American Chemical Society in Philadelphia was a decided success. More than 150 rubber chemists from different sections of the United States and Canada were present. An excellent program was given. The following is an effort to sum up in a few words the trend of the respective papers:

Report of Fruit Jar Ring Committee, L. J. Plumb, chairman.—At the previous meeting of the old Rubber Section the seriousness of the fruit jar ring situation was ably pointed out. As a result this committee was appointed to take steps to secure satisfactory jar rings for the American housewife. Through their efforts and those of the Department of Agriculture the jar manufacturers have ceased putting poor rings in jars, and have secured the co-operation of ring manufacturers in producing only high-grade articles. Inasmuch as the Department of Agriculture has a large number of demonstrators at work, all of whom have been instructed to help educate the public to accept only good rings, the committee did not feel that further work on its part was necessary, and asked to be discharged, which was done.

Report of Committee on Physical Testing, H. E. Simmons, chairman.—The committee has prepared a tentative scheme for physical testing. A most pleasing feature of the report was the fact that the metric system was used throughout. Its decided advantage over the English system of units is well known. The time saved and the increased accuracy due to its simplicity make it by far the most efficient. We understand that it has been in use for two years at the Goodyear Tire & Rubber Co. in Akron, Ohio. Most of the tests advanced have been in use for some time. The committee tried only to correlate the best procedure in each case. A new method for permanent set was advanced and the arguments in favor of it were presented by E. L. Davies of the committee. The test recommended consists of three stretches to 60 per cent of the breaking elongation, held each time for 10 min. with a 10-min. interval between stretches and measuring 10 min. after release. Mr. Davies pointed out that 60 per cent of the breaking elongation is the most satisfactory, since over this figure, tearing becomes a serious factor. He also showed that the set developed on one stretch did not consist of any constant fraction of the total set obtainable and that three stretches bring out practically all the set possible. Set, he explained, is probably due to plastic flow in the rubber.

A New Method for the Determination of Sulphur in Rubber Mixtures, G. D. Kratz, A. H. Flower and Cole Coolidge.—The new method recommended did not differ greatly from the old arsenious acid method except that zinc oxide was added instead of arsenious acid to raise the boiling point of the solution. The method was stated to be very rapid and also of a high degree of accuracy.

The Extraction of Rubber Goods, S. W. Epstein and R. L. Gonyo.—The authors used constant boiling point mixtures of acetone and carbon bisulphide and acetone and chloroform. They recommended the use of the mixed solvent as a time saver to take the place of separate extractions by acetone and chloroform. Inasmuch as these extractions give valuable qualitative information, as for example, a fluorescent chloroform extract indicates MR or related hydrocarbons, it is not likely that the old method will be dropped for some time.

Theory of Balloon Fabric Protection, John B. Tuttle.—The author discussed the requirements balloon fabric must meet, the most important of which are low permeability to hydrogen, good aging and low visibility. He mentioned iron oxide as a good pigment for protection.

Balloon Seam Construction, J. W. Evans.—Mr. Evans pointed out that the temperature inside the bag is 20 to 25 deg. F. higher than on the outside. The application of powdered aluminum as a reflector lowers the temperature on the inside by about 10 deg. F. He found that the high temperature was the cause of slippage at the seams. The most satisfactory cement was found to be a pure gum vulcanized by a dilute solution of sulphur chloride in carbon tetrachloride and benzol.

Expansion of Rubber Compounds, C. W. Sanderson.—The author reported the cubic coefficient of expansion of brown crêpe as 4.68×10^{-4} per deg. F. Fine Para has about half this value. It was pointed out that milling has a marked effect on the expansion coefficient. The expansion of compounded stocks is almost entirely due to the rubber present. When rubber is heated at a constant temperature the expansion curve (expansion vs. time) shows a rapid rise to a flat, beyond which there is no further increase.

He also pointed out that the specific gravity of a stock increases when it is vulcanized under hydraulic pressure. The difference in gravity between raw and cured stock is probably due to contained air, which is either forced out or greatly compressed by the pressure employed. The contraction noticed for solid tires he placed at about 3 per cent.

Volume Increase of Compounded Rubber Under Strain, H. F. Schippel.—This paper was perhaps the most interesting of all those presented. The author pointed out an entirely new fact, that compounded rubber increases in volume when placed under strain. This increase was found to be quite high. Values as high as 120 per cent were obtained with whiting. Gas black and zinc oxide when compounded volume for volume against barytes showed much lower increase, due probably to adhesion of the filler to the rubber. Pure gum shows this phenomenon only very slightly. A series of experiments with barytes elutriated to several different sizes showed that the increase in volume was a direct function of the size of the particle. Mr. Schippel closed his paper with a very pretty experiment. A ring of about 2-in. diameter (internal) was stretched over a lump of paraffine. The specific gravity of the aggregate was very close to 1, and the block barely floated. When the ring was secured on the small end of the lump of paraffine without stretching, the paraffine and ring settled slowly to the bottom, thus proving beyond a doubt that the stock in question had a lower specific gravity when stretched.

The Determination of Cellulose in Rubber Goods, S. W. Epstein and R. L. Moore.—The method which was given in detail consists essentially of dissolving the rubber in cresol, filtering through a Gooch, washing well with benzene and then several times with hot 10 per cent hydrochloric acid until no further soluble mat-

* Annual meeting, Philadelphia, Sept. 4 and 5, 1919.

ter is removed. The crucible and contents are dried and weighed. The next step is acetylation with acetic anhydride, after which the cellulose acetate is removed by washing with acetone. Cellulose is determined by difference.

The Variability of Crude Rubber, JOHN B. TUTTLE.—This paper consisted chiefly of a résumé of previous work by Eaton and Granthan, de Vries and others. This is a subject on which not a great deal of work has been done in this country.

The Action of Accelerators During Vulcanization, J. H. SCOTT.—Detailed experiments by Spence and the author were described. These consisted of the introduction as dry powder of various alkaline substances, such as NaOH, Na_2CO_3, $Ba(OH)_2$, soda lime and MgO; dipping in alkaline solutions; and the washing of rubber with caustic.

Considerable reduction in the period of vulcanization was shown by all alkalis tried. Zinc oxide was found to be an aid, while barytes was without effect. In addition the physical properties of the stocks were improved. Washing with alkali gave slightly improved physical properties but no decrease in time of vulcanization. Immersion in 5 per cent NaOH solution for 24 hr. produced a slightly shorter cure with a little higher tensile strength.

The author pointed out that alkalis are not satisfactory accelerators, due probably to the bad aging properties of the compounds. The fact that they are accelerators is of considerable theoretical interest. They probably function by the hydrolysis of the nitrogenous matter of crude rubber to amino acids, which are powerful accelerators, comparing favorably with piperidine.

Mr. Scott defined the ideal accelerator as one capable of bringing about vulcanization in the shortest possible time consistent with factory practice and which produces maximum polymerization. It should also be nonpoisonous and easily handled. For some time it has been recognized by rubber chemists that accelerators have another effect than merely decreasing time of cure. The increase in tensile strength, snap, feel and nerve the author attributes largely to polymerization.

The Action of Certain Organic Accelerators in the Vulcanization of Rubber, G. D. KRATZ, A. H. FLOWER and COLE COOLIDGE.—This paper consisted of a review of experiments with aniline, urea, thiourea, mono-, di- and tri-phenyl thiourea and mono-, di- and tri-phenyl guanidine, anhydro formaldehyde aniline and paraphenylene diamine. The authors attribute the curing power of these accelerators to their decomposition at the temperature of vulcanization in the presence of sulphur-giving aniline, which they claim has a grouping which readily functions as a sulphur carrier. They recommend comparing accelerators in molecular quantities.

Reactions of Accelerators During Vulcanization, C. W. BEDFORD and WINFIELD SCOTT.—This paper is a reply to and a criticism of a recent paper by Dubosc in the *India Rubber World*. The authors stated that hexamethylene tetramine decomposes when heated with sulphur at the curing temperature and gives off CS_2, NH_3 and H_2S, but no acetylene, as claimed by Dubosc. They also stated that methylene aniline decomposes when heated under similar conditions, giving CS_2, aniline and thiocarbanilide.

The Effect of Organic Accelerators on the Vulcanization Coefficient, D. F. CRANOR.—The author gave in detail the results of experiments with hexamethylene-tetramine and the addition product similar to thiocarbanilide produced by the action of CS_2 on dimethylamine. He showed that the coefficient of vulcanization bears no direct relation to the physical properties. He obtained a technical cure with the dimethylamine addition product when the coefficient of vulcanization was aproximately 1.00. This falls in line with Scott's statement regarding the polymerizing influence of accelerators. Dimethylamine-dimethyl-dithiocarbamate is an extremely powerful accelerator. One-half per cent brings about a cure in 5 min. at 40 lb. steam.

Some Methods of Testing the Hardness of Vulcanized Rubber, H. P. GURNEY.—This paper consisted of a review of the different methods of determining hardness of rubber goods and contained data on the Shore hardometer and the Pussey-Jones plastometer.

The Manufacture and Use of Crimson Antimony, J. M. BIERER.—The author gave a detailed description of the preparation of crimson antimony, i.e., antimony oxysulphide. The important points on the preparation are purely of antimony trichloride solution, and the concentration of the acid used for precipitation.

Research on Zinc Products for the Rubber Industry, P. R. CROLL and I. R. RUBY.—It was pointed out that the New Jersey Zinc Co. is very desirous of improving the quality of its zinc oxide for the rubber industry and has installed a rubber division in its new research laboratory for this purpose. Lantern slides showing the ultimate particles of zinc oxide were exhibited. Zinc oxide is crystalline and the particles vary in size from 0.1 to 1 micron, the average being 0.5 micron. Their microscopic work is excellent and is fundamental to an understanding of compounding phenomena.

Carbon Black—Its Properties and Uses, ST. J. PERROTT.—This paper was delivered in the Division of Industrial Chemists and Chemical Engineers and proved so interesting that Chairman Tuttle invited Mr. Perrott to give it also before the rubber division. The manner of producing gas black by incomplete combustion of natural gas, allowing the smoky flame to strike a cold metal surface (air cooled) was illustrated by lantern slides. From the black cloud issuing above the plant shown, one would gather that technique of this industry is not very highly developed. Mr. Perrott showed several slides of micro-photographs of gas black and stated that the particles varied in size from 30 to 100 milli-microns.

The paper of H. E. SIMMONS on the value of a library to the rubber laboratory was not given, but will be published soon. Owing to the absence of GEORGE OENSLAGER his paper on the testing of pigments was held over until the next meeting of the Rubber Division. The paper of C. OLIN NORTH on the effect of compounding ingredients on the physical properties of rubber was unfortunately not in final shape for presentation, but will doubtless be given at the next meeting of the division.

ELECTION OF OFFICERS

The officers elected for the coming year are Dr. WARREN K. LEWIS, chairman; and ARNOLD H. SMITH, secretary. Dr. Lewis is a well known member of the chemical engineering staff of Massachusetts Institute

of Technology and has been acting as consulting engineer to the Goodyear Tire & Rubber Co. for several years. The Rubber Division is fortunate in securing the services of Dr. Lewis, who is widely known because of his ability to "start something." Mr. Smith is the efficient secretary who served the Rubber Division so well this year.

A rising vote of thanks was tendered the retiring chairman, Mr. Tuttle, who has perhaps had more to do with the organization of the Rubber Division than any other rubber chemist, and to whose untiring efforts, with those of Mr. Smith, the success of the recent meeting was largely due.

The success of the Rubber Division is now assured. As was pointed out by Dr. CHARLES L. PARSONS in a brief talk, it was only necessary that the rubber chemists should meet and get acquainted, when they would cease being suspicious of one another and would jump in and make the thing a success. It augurs well for the rubber industry.

Iron and Steel Output

The London *Economist* of May 31, 1919, gives the following figures for the iron and steel output of the chief producing countries before and during the war:

Year	United Kingdom (Long Tons)	United States (Long Tons)	Germany (Metric Tons)	France (Met. Tons)
PIG IRON				
1900	8,960,000	13,789,000	8,521,000	2,714,000
1905	9,608,000	22,992,000	10,988,000	3,077,000
1910	10,012,000	27,304,000	14,793,000	4,032,000
1911	9,526,000	23,650,000	15,534,000	4,939,000
1912	8,751,000	29,727,000	17,753,000	4,939,000
1913	10,260,000	30,966,000	19,292,000	5,207,000
1914	9,924,000	23,332,000	14,392,000	†
1915	8,794,000	29,916,000	11,790,000	†
1916	9,048,000	39,435,000	13,285,000	1,447,000
1917	9,420,000	38,621,000	13,142,000	1,684,000
1918	9,066,000	39,052,000	*11,590,000	1,297,000
STEEL				
1900	4,901,000	10,188,000	6,646,000	1,565,000
1905	5,812,000	20,024,000	10,067,000	2,240,000
1910	6,374,000	26,095,000	13,699,000	3,390,000
1911	6,462,000	23,676,000	15,019,000	3,681,000
1912	6,796,000	31,251,000	17,302,000	4,428,000
1913	7,664,000	31,301,000	18,959,000	4,687,000
1914	7,835,000	23,513,000	14,973,000	†
1915	‡8,550,000	32,151,000	13,258,000	†
1916	‡9,196,000	42,774,000	16,183,000	1,952,000
1917	‡9,804,000	45,061,000	16,587,000	2,232,000
1918	‡9,591,000	45,073,000	*14,874,000	1,912,000

* Including Luxembourg up to October, 1918. The returns for November and December, 1918, do not include the production of Luxembourg, Saar district and the disannexed Lorraine Province.
† No returns.
‡ Including steel castings.

United States Platinum Corporation Proposed

A concern to be known as the United States Platinum Corporation, to be chartered by Congress and to be supervised by a Government commission of five members, is proposed in a bill introduced by Representative O'Connell of New York. The operations of the company are to be confined to the public domain in Alaska. A royalty of one-eighth of the net products obtained from platinum sands is to be paid to the Government. L. R. Beckley and unnamed associates are the incorporators of the proposed corporation.

German Production of Fertilizers

According to the *Deutsche Allgemeine Zeitung*, the production of certain fertilizers in Germany during 1913-14, 1917-18, and 1918-19, was:

Articles	1913-14 Tons	1917-18 Tons	1918-19 Tons
Nitrogen	210,000	92,334	80,000
Phosphoric acid	530,000	325,000	220,000
Potash	557,350	779,400	520,000

Engineering Council Addresses the President Regarding United States Maps

Engineering Council, through its chairman, J. Parke Channing, has brought to the attention of the President the lack of co-ordination among the official map-making agencies of the Government. Setting forth the fact that every industry, art and science which demands a knowledge of the lay of the land is dependent upon suitable maps, and emphasizing the value of co-ordinating governmental efforts on the making of a base map of suitable accuracy and scale, Mr. Channing called to the attention of the President the fact that the official map work of the United States is now being prosecuted by 12 separate and distinct Federal agencies. Most of these agencies are making maps for special purposes, which are of little value for any other purpose. The amount of money now being expended would, if covered into a well-co-ordinated mapping plan, produce better and more useful results than that which now can be shown by the aggregate production of all Government map-making agencies. A portion of the argument presented follows:

"Engineering Council believes that the chaotic condition above described is wrong. It makes this presentation to the Executive because he is the one authority having jurisdiction over all of the Federal agencies above mentioned. It is the opinion of Council that the most purposeful way to bring order into map making and to expedite the completion of our topographic map is to appoint a Board of Surveys and Maps consisting of a representative from each of the present Federal map-making agencies, together with representatives from well-qualified map-using agencies, which would be vested with authority to work out a plan of standardization and co-ordination of the work of the Government, and to report the same to the President for such action as he may find wise.

"In order to give further definition to the present petition and to facilitate your consideration thereof, Engineering Council suggests the following unofficial bodies as the proper ones to participate in the work of the Board: The American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Association of State Geologists, the National Research Council, the American Association of State Highway Officials and the Engineering Council."

Government Disposes of Surplus Phenol

Thirty million pounds of phenol, the entire surplus stock of the War Department, has been sold to the Monsanto Chemical Works of St. Louis and New York. The Monsanto company has agreed to resell this phenol at prices to be fixed by the War Department, but is to receive a 2 per cent commission to cover the expenses of selling. The chemical company agrees to dispose of the phenol within four years or less, or at the end of the four years to purchase any remainder at such a price as arbitrators may designate. An officer of the Ordnance Department will be assigned to the Monsanto Works to represent the Government in the carrying out of the contract. Preference is to be given to purchasers who intend using the phenol for consumption in the United States. No orders for less than a carload lot will be considered.

FIG. 1. FRONT VIEW OF PITTSBURGH LABORATORIES, BUREAU OF MINES

Description and Activities of the Pittsburgh Station, Bureau of Mines

A New Laboratory Building Costing About One Million Dollars Has Been Dedicated to the Service of the Public at Pittsburgh by the Bureau of Mines — Its Activities Cover a Wide Range of Subjects of Importance to Chemical and Metallurgical Enterprise

BY E. E. THUM

DEDICATION of the new Pittsburgh Station of the Bureau of Mines, Sept. 29, was an important milestone in the development not only of this particular station, but of the Bureau as well. Coming at a time when the activities lately so engrossed with war problems are being returned to their normal channels, the provision of such extraordinary experimental facilities promises an equally wide range of future usefulness.

DEVELOPMENT OF STATION ACTIVITIES

Activities such as are now centered in this new station were begun in Pittsburgh in 1908, before the Federal Bureau of Mines was established. This early work was a continuation of the investigative work on coals begun at the St. Louis Exposition, 1904, under the U. S. Geological Survey, the lamented Joseph A. Holmes being chief technologist in charge. A nucleus of instrumental equipment from that World's Fair was installed in the old Butler Street arsenal by arrangement with the War Department. Directed first to the investigation of coal mining problems and of fuels, the chief motive was a desire to guard the miner from the risks incident to his occupation. At the time of the passage of the act establishing the bureau (1910), the factors most effective in calling attention to the need of governmental action were several frightful mining disasters in December, 1907, and a growing realization of the preventable waste of life and resources in the mining and metallurgical industries, later culminating in the "Safety First" movement.

Therefore the statute creating the Bureau of Mines of the Interior Department authorized the new organization to investigate methods to increase health, safety and efficiency in the mineral industries, which being widely interpreted means that the Bureau is enabled to act in many directions all centering upon the conservation of life, material and resources in mining, quarrying, ceramic and metallurgical industry. Having no police powers, the Bureau must translate its findings to practice thorough education, and by co-operation with private corporations or public institutions. With such a wide field of activity, it is also natural that work be segregated at various points geographically well situated with respect to each particular subdivision. Therefore, aside from the general administrative offices at Washington, and important specialized activities at other points, the so-called "stations" of the Bureau now number eleven, as given in the table.

While it is not the present purpose to discuss the work of the Bureau as a whole, the Pittsburgh station is of general interest in that it may be regarded as the parent station, being the headquarters of the Supervisor of Stations, Dr. Dorsey A. Lyon, and having many facilities serving all stations in common. Such a central clearing house is obviously necessary in order to insure the most effective action of all branches among themselves and with the various State agencies working along similar lines, to harmonize activities and avoid needless duplication of effort. Again, although the principal work of the Pittsburgh Station has to do with coal mining, several other cognate divisions are

STATIONS OF THE BUREAU OF MINES
Dr. Dorsey A. Lyon, Supervisor of Stations

Superintendent	Name of Station and Location	Date of Establishment	Scope of Major Investigations	Principal Co-operating Institutions
E. A. Holbrook	Joseph A. Holmes Memorial Station at Pittsburgh, Pa.	1908	Coal mining in all its phases, including mine safety, first-aid, and mine rescue work, testing of explosives also metallurgy of iron and steel.	
C. A. Herbert (acting)	Middle-West Station at Urbana, Ill.	1908	Coals of the Middle-West fields, and general coal preparation.	University of Illinois. Illinois Geological Survey.
Thos. Varley	Inter-Mountain Station at Salt Lake City, Utah.	1910	Complex and low grade ores, especially those of zinc and lead. Concentration problems.	University of Utah.
R. B. Moore	Rocky Mountain Station at Golden, Colo.	1910	Rare metals especially. Problems connected with the mining and metallurgical treatment of other ores commonly found in Colorado.	State School of Mines.
L. H. Duschak	Pacific Station at Berkeley, Cal....	1911	Metallurgical treatment of the ores common to California (gold and quicksilver).	University of California. Industrial Accident Commission of California.
C. E. Van Barneveld	Southwest Station at Tucson, Ariz..	1916	Metallurgy of the ores common to the Southwest and especially hydro-metallurgical treatment of low-grade copper ores.	University of Arizona. Miami Copper Co.
F. K. Ovitz	Northwest Station at Seattle, Wash.	1916	Problems connected with the mining and utilization of the coals of Alaska and the Pacific Northwest; also problems connected with the treatment of the non-ferrous ores of those districts.	University of Washington. Oregon Bureau of Mines & Geology. University of Idaho.
J. A. Davis	Alaska Station at Fairbanks.....	1916	The problems connected with the mining industry in Alaska.	
R. T. Stull	Ceramic Station at Columbus, Ohio.	1917	Clay industries and ceramics.	Ohio State University.
C. E. Julihn	Lake Superior Station at Minneapolis, Minn.	1917	The problems connected with the mining and beneficiation of low-grade iron ores, manganese ores, and other ores of the Lake Superior District.	University of Minnesota.
W. P. Dykema	Petroleum Station at Bartlesville, Okla.	1917	Problems connected with the production of petroleum and the conservation and utilization of petroleum and natural gas.	

maintained of much more interest to chemists and metallurgists, and it is important to note that coal mining rescue investigations were responsible for the Bureau's invaluable assistance in developing poison gases for use against the Germans and gas masks for protection against enemy efforts in the same direction. Therefore a description of the station and its activities will doubtless be of general interest.

Location of New Building

The new building itself was planned in a general way by the first director, Dr. Holmes, who early visualized the wide field of the Bureau. It was largely through his efforts that the Forbes street site and the necessary appropriation were secured. Construction of the main building was completed late in 1917. Located on the edge of Schenley Park, flanked on either side by the Carnegie Institute of Technology and the magnificent museum, it is situated in the close vicinity of the center of intellectual and scientific life of Pittsburgh. Thus the resources of the University of Pittsburgh, the Mellon Institute and of kindred institutions are readily available. A front view is given in Fig. 1. Fig. 2 is a view of the buildings from the rear; the central portion is occupied by general and administrative offices, while at the rear is an adequately equipped auditorium capable of seating 240 persons (Fig. 3), available for public use at nominal charges. Laboratories occupy the east and west wings, while in the foreground of Fig. 2 is shown the power house, necessary to house the large-scale combustion or boiler tests on carload lots of various coals. From the front, the main entrance is a massive archway, a monolith in concrete; eagle, decorations and all details forming one great block, to which a special treatment has given a surface accurately imitating granite, altogether a fine and artistic piece of work. An idea of the general interior finish may be had from Fig. 4, which shows the entrance hall and a corridor leading to the west wing, finished in pressed brick and ornamental tile, while the analytical laboratories are furnished with an eye to utility, as shown in Fig. 5.

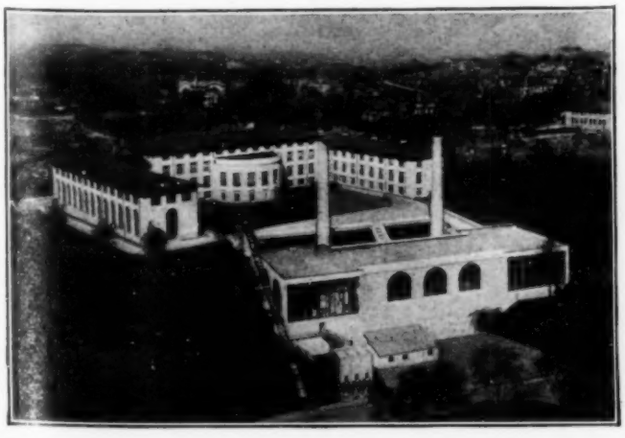


FIG. 2. PITTSBURGH STATION, BUREAU OF MINES; VIEW FROM THE REAR, SHOWING POWER HOUSE, EAST AND WEST WINGS AND AUDITORIUM

The central portion of the building is occupied on the ground floor by administrative offices and conference rooms, and the library occupies a portion of the second floor. A mess hall and quarters for the drafting, computing and photography divisions occupy the top. Pittsburgh houses the largest of the seven branch libraries of the main Bureau library in Washington, having some 6600 books and regularly receiving nearly 200 periodicals. Its scope covers physics, chemistry, geology, mechanical and electrical engineering, mining, metallurgy, chemical technology, industrial safety, hygiene, and miners' occupational diseases.

In order to eliminate routine work by investigators, the station has a corps of draftsmen, photographers, computers and clerks, who co-operate with the specialists in the design of special equipment, in the reduction of notes, and in the preparation of data and illustrations for reports. A well-equipped instrument shop is also provided which is manned by tool-makers and glass-

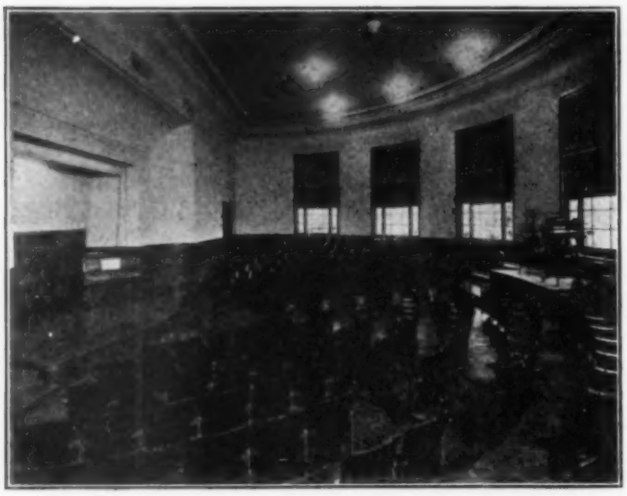


FIG. 3. THE AUDITORIUM OF THE BUREAU OF MINES LABORATORIES

blowers capable of building scientific equipment. In addition to routine work of this kind, the photographic department is equipped and manned to take, develop and exhibit motion pictures, thus constituting an important element in the Bureau's educational campaign for promoting safety and health among miners. About 150 reels are now available for public exhibition. The Bureau's equipment is complete for taking films on the surface, within buildings or under ground. Usually, the exposures are made in co-operation with the mine or plant to be pictured, the Bureau furnishing the apparatus, technician and film, while the co-operator furnishes the incidental help and necessary arrangements.

A spacious mechanical laboratory occupies the entire area of the west wing, being two stories in height. During the war it was occupied by a large assortment of physical testing machines borrowed from educational institutions for ordnance work. Apparatus actually belonging to the Bureau is yet somewhat meager; in fact, almost the entire west wing is provided in anticipation of future activities of the organization, as yet unformulated. Considerable space on the top floor is devoted to the investigation and certification of various electrical systems and items of equipment for safe use in gassy and dusty mines.

Researches on Gas

Gas investigations and mine rescue work is centered in the basement of the central portion and east wing, with important auxiliary chambers and equipment at the experimental mine, a few miles distant at Bruceton. As before noted, these were the first and yet remain the fundamental investigations of this particular station. While not directly interesting to chemists or metallurgists, it is worthy of note that such work, centering in Pittsburgh for about ten years, gave the Bureau a store of information on suffocating gases which was quickly turned to account in the late war. It is perhaps well known that the Bureau proposed a line of investigation which was eagerly indorsed by the War Department months before we entered the war. Investigations in gas offense and defense were well under way when war was formally declared, and were then carried on for some five months by the Bureau's own resources. Starting from a modest nucleus, by midsummer of 1917 about 50 experts were engaged in this work, mostly at American University, Washington, where were early transferred all these activities, and when finally the work was organized as the Chemical Research Division of Gas Defense and taken over completely by the War Department, about 1500 men were intensively studying problems in gas warfare.

Much of the data so secured should be available for industry, and the Pittsburgh station already has work well under way looking toward the application of the Army type of gas mask to industrial uses. Small concentrations of CO, NH_3, SO_2 and finest dust are extremely disagreeable and often quite dangerous if endured continuously, and proper canister fillings for their absorption have already been formulated. Much publicity has recently been given to this phase of the Bureau's work.

Metallurgical Activities

Metallurgy also has quarters in the basement of the east wing. Eventually, it is planned to center here important investigative work on iron and steel worthy of the volume of the industry in this vicinity, but for several years the work has been limited not only by a lack of funds, but by lack of requisite personnel. For the last three years the press of demand for steel products was so insistent that men of proper caliber were almost entirely engrossed in getting out the production.

Very important laboratory work was done during the war, however, for the district Ordnance Office. In this, the Bureau of Mines acted as host and did all the metallographical work, while physical and chemical testing was done at the station, by enlisted personnel of the War Department. Thousands of tests were made on various classes of metallic ordnance, and detailed investigations of the causes and remedies of certain defects brought to a successful conclusion. For the future of metallurgy at the Pittsburgh station, the present idea is not to establish extensive research laboratories so much as it is to co-operate with existing agencies and corporations in desirable lines of investigation. Thus, in steel, flaky structure and allied defects in alloy steels are still under consideration. An exhaustive investigation of the whole subject of heat-treatment of low-carbon steels is to be started in co-operation with the Bureau of Standards and interested manufacturers, the work probably to be done in Dr. Howe's laboratory

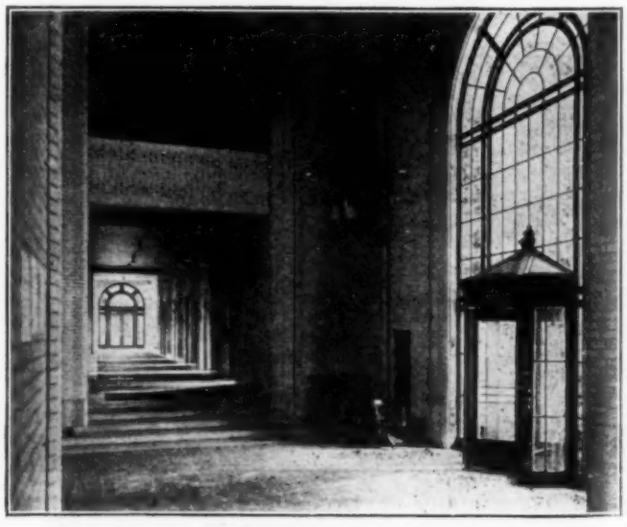


FIG. 4. ENTRANCE HALL

FIG. 5. TYPICAL ANALYTICAL LABORATORY

in Malvern Hills. In iron, a field investigation of factors of blast-furnace operation is under way, paralleling a like study of ferromanganese production which has been completed. Work on slags is also to be continued in co-operation with the committee on blast-furnace slags of the National Research Council.

In non-ferrous metallurgy, aside from the work on brass and bronze, which has been under way for a long time at Ithica (Cornell University), an investigation of foundry practice in aluminum has been started at Pittsburgh. It is hoped to formulate perfected melting and casting methods so that waste and scrappage may be largely reduced, primarily by the reduction of porosity, oxide and gas inclusions. In this connection the relative merits of proposed aluminum alloys will be considered as well as the relation between the quality of ingot metal to the resulting casting.

Chemical Laboratories

Chemical analysis occupies the bulk of the first floor of the east wing. The analysis of fuels for use of various departments of the United States Government is one of the chief duties of the analytical laboratory. Many samples of coal, coke, ores and other materials collected incidental to various investigations by the Bureau or co-operating institutions are also analyzed.

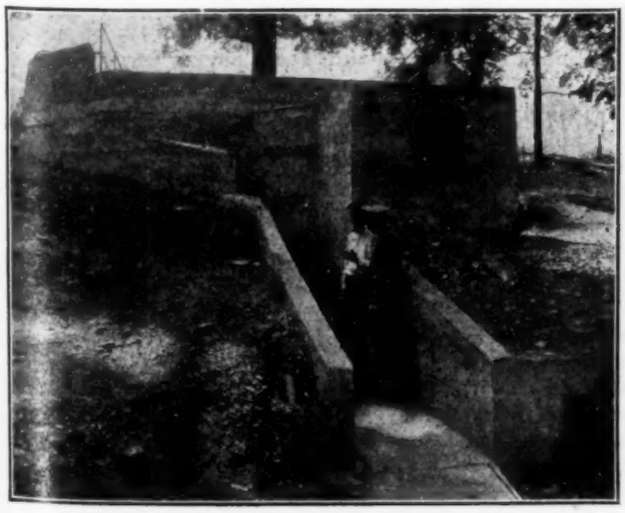


FIG. 6. BOMB PROOF FOR TESTING EXPLOSIVES

Here, also, has been under way the extensive researches on the fusibility of coal ash, which will be of much use in determining the liability of any fuel to cause excessive trouble from clinkering.

Explosive Testing

Perhaps the most interesting work being done at Pittsburgh, however, from a chemist's standpoint, is the investigations on explosives under way in the laboratories on the second floor, west wing, and at the testing plant at Bruceton, where all physical tests are conducted. At the latter point is installed equipment for investigating the gases evolved by explosions (most important in metal mining), the "permissability" of explosives in coal mining, and the rate of detonation (which largely measures the shattering effect), such apparatus consisting of two long galleries, three bomb-proofs, such as shown in Fig. 6, several separate magazines and instrument shelters, a ballistic pendulum, Mettegang recorder (Fig. 7), two impact machines, a pendulum friction machine, flame-testing apparatus, Bichel gages, a calorimeter and a variety of lead block

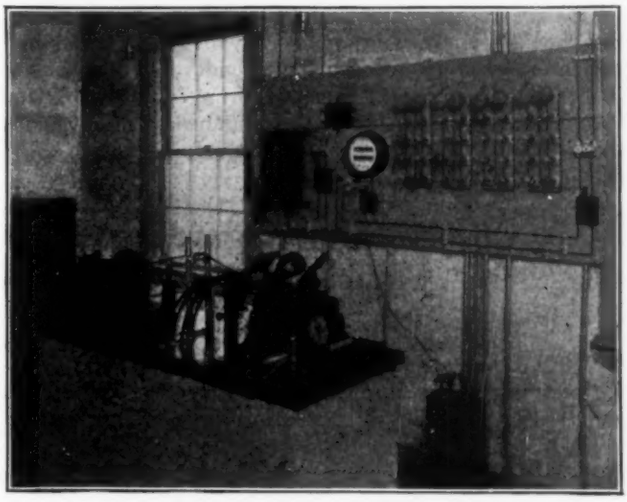


FIG. 7. METTEGANG RECORDER

expansion and compression test equipment. All the physical characteristics of explosives and different kinds of blasting supplies are here investigated in order that they may be classified so a user may have information on any of the various dangers attending their use, particularly in mines.

Routine analyses of explosives are made at the chemical laboratory, periodically checking the composition of the "permissible" explosives on the market. Much work is also done on purchases of explosives by various Government departments; during the war, especially, the Bureau co-operated with the War Department on grenade fillers, shell fillers, gun greases, and on the proposed substitution of flax and the down of milk-weed, cat-tail and white smoke-root for cotton and for glycerine in the manufacture of nitroglycerine. In the analytical work a continual effort is made to perfect the methods as to speed and accuracy, and much valuable work along these lines has been published. For instance, work is now under way on a modification of the sand test for detonators to give results more nearly proportional to the quantities of priming employed. As is perhaps well known, this test is made by placing an electrically fired detonator in the center of a definite quantity of standard sand contained in a steel block.

After explosion the sand is sifted and the amount of crushing is a measure of strength of the priming; it is also possible to determine whether detonation has been complete.

New explosives are also investigated. Thus, a series of tests on propylene glycol denitrate as a substitute for nitroglycerine has been completed, as well as much work on a cartridge composed of carbonaceous matter and liquid oxygen.

Power Plant

As may be seen from the view, Fig. 2, advantage has been taken of topography to place the powerhouse on a low level, behind the main building and out of sight from the front. It is a reinforced-concrete structure 55 by 220 ft., divided into three parts. At the west end is the fuel-handling equipment and three water-tube boilers. In the center of the building are installed the engines and electric generators, while the space at the east end is destined for apparatus for the study of heat transmission through boiler tubes, the study of combustion process within the fuel bed, and of problems of efficiency in domestic heating equipment of all sorts. Investigations of this sort are in charge of the fuel-efficiency section of division of fuels and mechanical equipment, and have rendered great service to other governmental bureaus in matters pertaining to fuel economy, and led to the issuance of publications that are believed to be of greater usefulness than those previously available.

Observations Regarding Chlorine Cells

By F. G. Wheeler

IN THE operation of all chemical machinery, questions regarding the various forms of construction and the best methods of operation are of prime importance to the engineer. This is particularly true of the electrolytic alkali industry, where many varying conditions in the application of the process exist. To answer some of these questions, the writer has experimented for many years, and has investigated many phases of this process. The results of these experiments have been embodied in several plants which are working on a large commercial scale today.

The most prominent questions which were solved were those regarding the efficiency of a cell, the overload capacity, the influence of temperature, the problem of feeding a cell constantly with brine, the impregnation of anodes, and the many conditions governing cell operation.

The type of cell which the writer adopted is one the form of which was first used by James Hargreaves in 1894. It was later developed by James Mercer and put into practical operation at Haverhill, Mass., in 1898. It was also used by Merry and Noble in England and later by Arthur Gibbs in the United States. The cell is cylindrical in form and built so that the entire exterior surface is cathode. Like a drum, it is able to withstand pressure from within without bracing and without distortion. This form of cell has been adopted by several of the largest electrolytic alkali manufacturers, and there are undoubtedly more cells of this type in operation than any other one form, and possibly all forms combined.

The cylindrical shape has the advantage of requiring no joints except those at the ends, which are held tight by means of a hoop. As a barrel is one of the cheapest forms of package, this form of cell is the cheapest to build. It adapts itself with the greatest ease to the many varying conditions which arise and is remarkably successful from a commercial standpoint.

The efficiency of a cell, by which we mean the proportion of product made compared to the amount of electricity used, was early observed by Hargreaves to be a function of the strength of liquor delivered, that is, the lower the percentage of hydroxide in the cathode liquor, the higher the efficiency. Hargreaves concluded that it was impossible to produce caustic soda with an electrolytic cell because of this action of the concentrated caustic soda. He fully understood the fact that if brine were passed through a diaphragm in contact with a perforated sheet of metal, which was made the cathode of a cell, and if one-half of the brine or less were converted to caustic soda, an efficiency approximating unity was easily obtained. He also used the idea of adding steam to the empty cathode compartment in order to wash the caustic away from the cathode to prevent the hydroxide ions from migrating into the anode solution. His idea, however, was to make a pure product in the cell, and he did not consider the manufacture of a solution of caustic soda mixed with salt and purifying it for commercial use.

The Diaphragm Problem

In our first experiments, we found that the caustic could be washed away from the cathode by using a very thin diaphragm which was very easily permeable to the brine. In the commercial operation of a cell, the diaphragm becomes plugged, not only with the impurities which might escape the filters, but with those made in the cell itself, such as disintegrated graphite, and from the action of the liquor on the diaphragm itself. It is obvious from this that the thinner a diaphragm can be made, the more slowly will it become impermeable. It is also apparent that the thinner it is, the less capillary action is present to hold the caustic soda solution between the two electrodes after it has once been formed.

The problem of making cheaply a very thin diaphragm is one of using a cathode which will hold such a diaphragm in position. The idea of supporting a diaphragm with the cathode is an old one and was used first by Hargreaves, and mentioned in his patent of Dec. 28, 1897. To apply this principle, a cathode was first designed using two sheets of metal. The inner sheet was a thin sheet having large perforations, and the outer was a heavier one having fine perforations. The idea was to place a thin sheet of asbestos paper against the inner sheet of the cathode. When it would attempt to burst through the large perforation of the inner sheet due to the pressure of the brine from within, the outer sheet would prevent its rupture, yet would still allow the products of electrolysis to be removed from the field of reaction.

A double cathode of this type is expensive to build and difficult to handle, so that a single sheet was devised which had all of the advantages of the double sheet. This cathode is made by displacing the metal removed from the large perforation backward, but not detaching it from one edge, leaving the flap in such a position that it prevents rupture of the diaphragm, but still leaves a three-sided perforation for the removal of the products of electrolysis.

A cell with this cathode is so designed that the edge formed in each large perforation is not thick enough to cut the diaphragm, yet at the same time the sheet of metal is heavy enough to conduct the current economically. These properties have been ascertained, so the constructon of a commercial cell is simple.

Cells built as described have an efficiency approximating unity over long periods of time, and plants are now operating with a commercial efficiency of over 95 per cent with no difficulties from diaphragms or cathodes.

Many industries require cells which can be shut down without damage, so this question was carefully examined. The usual difficulties connected with shutting down a cell arise from changes of temperature and also changes in the delivery of the hydrogen gas. The caustic soda which is formed on the cathode passes with the hydrogen gas through the openings in the cathode and is discharged into the cathode chamber. When a cell is shut down, the evolution of the hydrogen ceases, together with the consequent reducing action of the nascent hydrogen at the cathode. The diaphragm is then pressed against the cathode by the brine in such a way that the tiny passages which have been occupied by hydrogen are closed. The chlorine in the brine is not reduced by the nascent hydrogen evolved at the cathode during operation, but attacks the metal, forming ferric chloride. This passes with the brine into the cathode compartment of the cell. A small amount is retained in the diaphragm by capillary action. When the current is again started, the caustic soda, which is first formed, changes the ferric chloride into gelatinous ferric hydroxide, which partially plugs the diaphragm. The hydrogen formed simultaneously with the caustic soda has no easy method of egress or open passages, but must force its way through the pulpy diaphragm until it reaches the nearest opening in the cathode. The cells, therefore, do not deliver the caustic after a shut-down as easily as they did before. As the cell becomes warmer, the viscosity of the brine decreases so that it flows through the diaphragm more readily, the ferric hydroxide is slowly removed by the brine, the hydrogen creates passages to the nearest openings, and the cell returns to its previous operating condition.

Effect of Steam Treatment

The effect of steam, which is blown into the cathode compartment, was tested with various results. As predicted by Hargreaves, the steam dilutes the caustic soda on the cathode, and in this way helps to keep the efficiency of a cell high. The condensation of the steam on the jacket is easily cared for by trapping it away from the cathode liquor, so that this steam does not dilute the solution, but the condensation on the cathode itself has to be re-evaporated in the concentration department. The steam keeps the cell hot, lowers the viscosity of the brine, causing it to flow more easily through the diaphragm, reduces the concentration of the hydroxide ions, increasing the efficiency. A cell was operated for several months at an efficiency so close to unity that the difference could not be found by ordinary experiments. Cells which were old and worn out, and had been impermeable to the brine, were treated with steam and responded as mentioned above, the efficiency being increased somewhat, but the cost of renewal of a diaphragm is so small, about $3, and the additional cost of reconcentrating the solution so high, that no real advantage is gained. The question is simply a commercial one. If power is expensive, it may pay to use steam to save power, but where the power is cheap, the question would be an entirely different one.

Rating of Cells

Many cells are given a normal rating, which is described as being so many amperes. The writer often wondered upon what facts this capacity rating was based. Accordingly, an experiment was tried in which a cell was subjected to an enormous current with the hope of learning what would happen when an excess of current was passed through the cell. A cell was selected which would carry 750 amp. at 3.5 v. By means of an experimental generator, an additional current was superimposed upon the regular current, with the result that this cell carried 2300 amp. at 4 v. Unfortunately, the experimental generator could not be operated at a higher current, but the experiment was continued, with the result that at the end of four weeks two cells, which had been carrying 2300 amp. for this length of time, were delivering 93 per cent of the theoretical amount of caustic soda. We naturally concluded that there was no specific rating for any cell. If power is cheap, it is obvious that it does not pay to install a large number of cells and work them at a low current. The interest and depreciation on the cells will more than offset the power which is saved by operating these cells at a low voltage, and it therefore pays to use a higher voltage and pass a higher current. The whole question was worked out very carefully, numerous curves were drawn, and it was found that a minimum cost could be easily ascertained when local conditions were considered.

Feeding Device for Supplying Brine

Another phase of the subject is the method of supplying the brine to a cell. A successful feeding device must be one which has in it several important features. In the first place, it must be foolproof and require practically no attention when once started. It must maintain the level in the cell automatically, so as to keep conditions constant. It must be totally enclosed, so that no evaporation of brine will cause salt to crystallize in the feeding device. It must also have no constriction, nor can it be made to operate by means of a small aperture, for in any such device a particle of dirt, salt, or even an air bubble will cause it to fluctuate in the quantity of brine delivered. It must be cheap to construct. It must not allow any electrical current to flow through the brine being fed to the cell, because this to some extent grounds each cell and causes "electrolysis" in the pipe lines and other metallic parts of a plant. Bearing all of these things in mind, a feed was devised which delivers a broken stream through an enclosed piece of apparatus, in which there is no throttling effect and the quantity of brine delivered is controlled by the level in the cell itself. It consists in passing the brine through a chamber of gas. The gas in the chamber is held under a certain pressure due to the level of the brine in the cell, and this pressure regulates the brine being admitted to the chamber.

Problem of Electrodes

A very interesting experiment was made in connection with the preservation of graphite anodes. The first idea was to fill the pores of an anode with an

inert material, which would prevent the current from detaching particles of graphite. In this way the anode would have a much longer "life" than without this treatment. The graphites were first impregnated with various oils. It was soon found that the excess of oil in the pores of the graphite was discharged and floated on the surface of the brine, then chlorinated, forming a wax. This prevented the chlorine from escaping from the cell, and caused trouble.

A method was devised in which the inside of each pore in the graphite was painted with an inert liquid, in such a way that the wall of the pore only would be covered. There was no excess of oil to be discharged from the graphite after it had once been treated. After this problem was solved, almost every kind of oil was tested. Not only the common oils, but such material as vulcanized oils and mixtures with asphalt and pitch were used. A good selection was finally made and thoroughly tried out. The question of impregnation resolved itself into one involving the cost of power. It seems that impregnation not only saves graphite by making the inner surface of the pores resistant to the chlorine, but it also presents a smaller surface for the electricity, in passing from the anode. The increase in the current density on the graphite is shown by an increased terminal voltage on the cells, with the result that an anode which has been impregnated requires more power per ton of product than a cell in which the anodes have not been impregnated. The problem becomes one of choosing whether the cost of impregnation plus the cost of power is cheaper than the cost of graphite. Where power is cheap, it pays to impregnate.

Conclusion

When a cell is constructed according to the principles which we have described, with a good feeding device, with the graphite either impregnated or not according to local conditions, made so that it will work at a high temperature, and with the proper local conditions taken into consideration, there is little difficulty in making a plant deliver caustic soda and chlorine at almost any efficiency desired, and at a voltage which will net a handsome profit even under some of the most difficult conditions.

Bureau of Foreign and Domestic Commerce Publishes the First of Its Educational Series

"Selling in Foreign Markets," by Dr. Guy Edward Snider, of the College of the City of New York, has just been published by the Bureau of Foreign and Domestic Commerce. This is a collection of readings of some 600 pages, covering in a logical and co-ordinated manner various phases of marketing American products abroad. The new movement in education for foreign trade, the keynote of which is the unit short course dealing with some specific phase of the subject in a detailed and concrete manner, disclosed the fact that literature of a specific nature is lacking. There has been a great deal published for general reading in foreign trade, but little has been written specifically for college work. The Bureau of Foreign and Domestic Commerce, in co-operation with the Federal Board for Vocational Education, is extremely desirous of having introduced into educational institutions, including reading circles, a type of foreign trade study as is supplied in its publication "Selling in Foreign Markets."

Synopsis of Recent Chemical and Metallurgical Literature

Stainless Steel.—The literature relating to this interesting alloy is exceedingly meager. Two contributions have been made recently, however, which throw some light upon the history and properties of this alloy, although the chemical composition is not disclosed.[1] Stainless steel was discovered in the research laboratories of Thos. Firth & Sons, Ltd., Sheffield, by Harry Brearley, while working on armor piercing projectiles for the Russian Government. It was soon found that the new alloy did not scale easily and did not tarnish when exposed to the action of many acids, including fruit acids. This suggested its use in the cutlery trade. R. F. Mosley's cutlery works was the first to use it for this purpose. The alloy is not protected by patents in England, but the foreign patents are controlled by the Firth-Brearley Stainless Steel Syndicate, with the exception of the American patents, which were sold to a co-operating body of large steel makers, the American Stainless Steel Co., of Pittsburgh. (U. S. P. 1,299,404, granted to Elwood Haynes on Apr. 1, 1919, and assigned to this company, relates to a chromium-iron alloy containing 20 to 25 per cent Cr and 0.1 to 0.5 per cent C, which is claimed to be practically permanent against fruit acids, exposure to air and rain, etc.).

This steel is capable of attaining, by suitable heat treatment, a wide variation in mechanical properties up to extreme hardness. It does not scale appreciably under 800 deg. C., while its tensile strength is not materially reduced at 400 deg. C. This property, in combination with the resistance to erosion, led to the use of the alloy for the manufacture of exhaust valves for airplane engines. Among other engineering applications of the alloy may be mentioned: Turbine blades, pump rods and valves, acid pumps, rams, cotters, evaporating pans, races and rollers for bearings, steam traps, etc. Since the steel is unaffected by salt water or sea air, it may be employed for a variety of marine purposes. In the electrical field, stainless steel is used for permanent magnets and for electric cooking stoves and utensils, where the advantages of permanently bright and clean surfaces in assisting the reflection of heat and consequent economy of current are immediately apparent.

A New Process for the Synthesis of Ammonia.—The Hampel-Steinau process for the synthetic manufacture of ammonia is described in the Dec. 18, 1918, issue of the *Technische Rundschau*. The examination of the patent previous to issue, by the German patent office, shows the principle to be completely new. In place of using a catalyzer to increase the velocity of combination of nitrogen and hydrogen, Hampel-Steinau utilize the properties of nascent hydrogen, combining it with nitrogen as it is in the act of being formed. The nascent hydrogen is produced by the action of chemical compounds on suitable metals, a large choice of detail being possible in this respect.

In the preferred form of the process, ammonium chloride acts on iron to produce the nascent hydrogen. It is well known that at 250 to 300 deg. C. ammonium chlo-

[1] "Story of Stainless Steel," *Iron Age*, July 31, 1919, p. 294 (taken from the *Organizer*, a British monthly); "Firth's Stainless Steel," *Electrician*, July 25, 1919, p. 97.

ride splits up into NH_3 and HCl. If iron is present, the HCl acts on the iron to produce hydrogen, thus furnishing the nascent hydrogen for the process. If nitrogen (made from liquid air) is also present, it unites with the hydrogen to produce NH_3. The iron chloride formed is brought into solution, and precipitated by part of the NH_3, enough being used to re-form the original quantity of NH_4Cl.

The reactions described may be thus set down:

$$6NH_4Cl = 6NH_3 + 6HCl$$
$$6HCl + 3Fe = 3FeCl_2 + 6H$$
$$6H + N_2 = 2NH_3$$
$$3FeCl_2 + 6NH_3 + 6H_2O = 3Fe(OH)_2 + 6NH_4Cl$$

The first three reactions, being in reality simultaneous, may be written thus:

$$6NH_4Cl + 3Fe + N_2 = 3FeCl_2 + 8NH_3$$

Six of the eight molecules of NH_3 are used to regenerate the NH_4Cl, leaving a gain of $2NH_3$, while the iron hydrate precipitate is filtered out, dried, and treated by reducing gases to regenerate the iron powder. The whole process is thus a circle, with only water and nitrogen coming in and NH_3 coming out.

The process goes on smoothly in the particular apparatus which has been devised for it. With 50 atmospheres pressure and at about 300 deg. C., the gas mixture obtained is 98 to 99 per cent NH_3, of which three-quarters goes back into the process for precipitation of the iron salt, leaving 23 to 24 per cent of the ammonia as clear gain. The apparatus is only slightly attacked, and no ammonium chloride is lost.

The nitrogen needs to be prepared, as in other processes, but not the hydrogen. The gas obtained is 98 to 99 per cent ammonia. The advantages of the process appear to be numerous.

Recent Chemical and Metallurgical Patents

Complete specifications of any of the United States patents may be obtained by remitting 5c. each to the Commissioner of Patents, Washington, D. C.

Rare Earth Oxide Ceramic Structure.—The increase of electrical conductivity with increase in temperature shown by ceramic materials containing silicates, such as porcelain, earthenware, etc., is explained by the theory that devitrification of fused silica is due to depolymerization of large silica molecules, giving a greater number of charge-carrying bodies. On the basis of this assumption, CHARLES KNOX HARDING of Chicago has studied the possibility of producing insulating ceramic materials free from silica. He has found that the neutral tri-valent and tetra-valent earth oxides, such as lanthanum, thorium, zirconium and didymium, are especially suitable for this purpose. They may be obtained from monazite sand. As an example, finely ground calcined lanthanum oxide with air dry lanthanum phosphate and 6 to 12 per cent gelatinous lanthanum hydroxide may be subjected to a high pressure in a metal die and formed into a very compact structure which will not check in air drying and which may be fired to a very high temperature (above Seger cone 20) without injury. (1,296,076; Mar. 4, 1919.)

Metallic Magnesium From Magnesium Oxide.—Attempts to produce magnesium by a method similar to that used for aluminum have been unsuccessful, owing to the slight solubility of the oxide in the double fluorides of magnesium. GEORGE O. SEWARD has found that triple fluorides of magnesium, barium and sodium, such as $MgF_2 : BaF_2 : NaF$ (sp. gr. 3.22), have specific gravities so nearly approaching that of magnesium oxide (3.60) that the bulk of the latter will remain in suspension in the molten bath. Some of the oxides floats on the surface, thus preventing the escape of free fluorine and at the same time protecting the anodes from "necking in" by oxidation just above the electrolyte. Although the oxide dissolves to the extent of only 0.1 per cent in the bath, the oxide in solution is replenished as electrolysis proceeds by the large excess of oxide in suspension. It is also possible to use magnesium carbonate, as this calcines quietly to the oxide, while floating on the bath. The cell is similar to the modern aluminum furnace. Molten copper is used as cathode, since it forms fusible alloys with magnesium but does not readily alloy with sodium. The working temperature is about 950 deg. C. and the current density 400 amp. per sq.ft. of cathode surface. (1,310,449 and 1,310,450; assigned to American Magnesium Corp.; July 22, 1919.)

Electric Furnace Electrode.—MARK SHOELD of Chicago, Ill., has devised an electric arc furnace electrode which is capable of being built in larger sizes than is at present practical, by combining seven small cylindrical electrodes into one unit. This arrangement has several advantages: an accident to one element will not seriously interfere with the furnace operation; the current density is reduced because of the larger surface area; the individual elements are less prone to damage caused by the warping and twisting stresses. (1,313,126, Aug. 12, 1919; assigned to Armour Fertilizer Works, Chicago.)

Clay Binder and Process for Making Same.—HENRY L. KOHLER of St. Louis, Mo., improves the quality of fire-clay brick and makes possible the manufacture of brick from clays which do not in themselves contain sufficient bonding properties. This is accomplished by adding from ½ to 5 per cent of anhydrous aluminum sulphate to the finely pulverized clay, which has been previously mixed with a certain amount of water. The aluminum sulphate crystallizes by combination with this water and thus acts as a temporary binder, making it possible to mold the product. In the molded product, after standing for a sufficient length of time, the aluminum sulphate reacts with aluminum silicate, forming basic aluminum sulphate and silicic acid. Upon burning, the sulphates are converted into oxides and the silicic acid into aluminum silicates, these acting as binders. The products are more resistant to disintegration caused by temperature changes and a larger percentage of perfect brick results from this method of manufacture. (1,312,853, Aug. 12, 1919.)

Electric Furnace.—JAMES H. GRAY of New York City designs the tilting device of an electric furnace so that the center of rotation is near the top of the furnace roof. This arrangement permits of supporting the electrodes and cooling rings from above by means of cables. The electrodes are thus held stationary while the charge is being poured, and are thereby relieved of the strains produced when the electrodes are tilted with the furnace. The mechanical details of furnace construction are simplified, because it is not necessary to design the furnace to support the weight of the electrodes, cooling rings

and their appurtenances. The design is of particular advantage when large currents are supplied at low voltage; the large sized flexible conductors required to carry the current are much shorter than in the usual design. (1,313,890, Aug. 26, 1919.)

Oxalic Acid From Paper Mill Waste Liquors.—Waste liquor is evaporated so that a dry or semi-dry residue is obtained. This is mixed with four times its weight of caustic alkali and heated in thin layers for 6 hr. at 250 deg. C. Sufficient water is added to dissolve the excess alkali and soluble organic material, leaving sodium oxalate in the residue. A second leaching with fresh water dissolves the sodium oxalate. From this solution, oxalic acid is recovered in the ordinary manner by precipitating calcium oxalate and decomposing this with sulphuric acid. (1,310,713; HERBERT C. REED of Stamford, Conn.; July 22, 1919.)

Use of Trinitro-Nitranilid and Sulphocyanates in Primers.—In place of mercury fulminate, WILLIAM H. BUELL proposes to use 2.4.6-trinitro-nitranilid, $C_6H_2(NO_2)_3NHNO_2$, with potassium chlorate, antimony sulphide and sulphocyanates of lead, copper, etc., in the proportion of 10, 50, 15 and 25 parts by weight, respectively. (1,311,872; assigned to E. I. du Pont de Nemours & Co.; Aug. 5, 1919.)

Annual Sample Fair at Barcelona

There has recently been organized in Barcelona a corporation under the title of "Feria de Barcelona, S. A.," with a capital of 500,000 pesetas ($100,000), for the purpose of holding annual sample fairs similar to those of Lyons, Bordeaux and Leipzig. The mayor of Barcelona will be president of the executive committee. Preparations are under way for holding the first fair during the spring of 1920.

Book Reviews

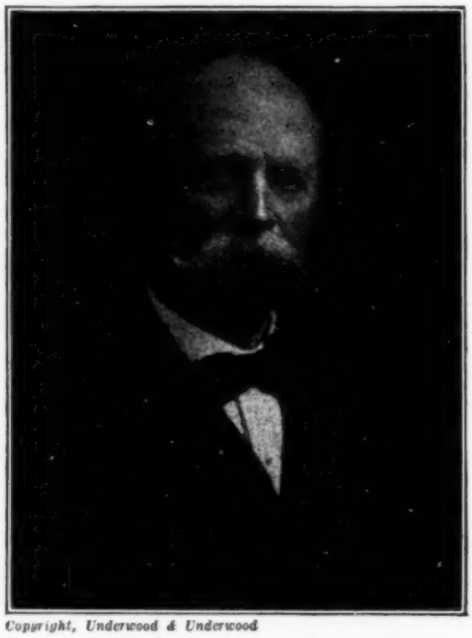
THE JOURNAL OF THE INSTITUTE OF METALS, Vol. XXI. Edited by *G. Shaw Scott, M.Sc.*, Secretary. 508 pages. London: The Institute, 36 Victoria Street, Westminster, S. W. 1.

This volume, one of the most important if not the largest yet published by the Institute of Metals, contains the lengthy "Fourth Report of the Corrosion Committee," by Guy D. Bengough and O. F. Hudson. After a brief consideration of current theories of corrosion, the authors present the result of their own detailed experimentation on the corrosion of zinc, copper, aluminum and brass, this part alone occupying over 100 pages of text. Next follows Part II, on the corrosion of condenser tubes, which was briefly abstracted in CHEMICAL & METALLURGICAL ENGINEERING for June 1, 1919, p. 594. Finally, the authors conclude with 15 pages of notes on the practical aspects of the corrosion problem, such as the effect of scale, methods of electrolytic protection, and other methods of hindering corrosion. Altogether, with discussion, this report occupies some 250 pages.

It is safe to say that this report is by far the most important publication on corrosion which has appeared in the last five years, and consequently the volume will be found indispensable to all students of this most important waste in metallic materials. In addition to the corrosion report, this volume of the Journal contains its usual array of authoritative papers on non-ferrous metallurgy, such as micrography of aluminum and its alloys, and the effect of work on various alloys. Fifty pages of abstracts of the literature complete the volume—a feature in itself which is of great importance. E. E. THUM.

Obituary

Dr. E. G. LOVE, treasurer of the American Chemical Society, former president of the Chemists' Club, and for a long time chairman of its house committee, died Friday evening, Sept. 12, from surgical shock following an operation. He was 69 years of age. He was a graduate of Hamilton College and of Columbia University, and in 1877



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DR. E. G. LOVE

was made gas examiner for the City of New York. For many years he maintained a laboratory in New York City, and several years ago was made chief chemist for the Consolidated Gas Co. Dr. LOVE was very well known among the chemists of America, and had been active at meetings of chemical bodies for many years. He was a man of rare popularity.

Personal

Dr. L. H. BAEKELAND, honorary professor of chemical engineering in Columbia University, has been decorated by King Albert with the Order of the Crown of Belgium.

Major F. E. BREITHUT, Chemical Warfare Service, has been honorably discharged from the Army. Dr. Breithut has resigned as assistant professor of chemistry at the College of the City of New York to take a position with the Foundation Oven Corporation, Woolworth Bldg., New York City.

Mr. H. K. DAVIES, formerly with Wallace & Tiernan Co., Inc., of New York City, has recently entered the employ of the Pennsylvania Salt Manufacturing Co., Widner Bldg., Philadelphia, Pa., for the purpose of developing the use of liquid chlorine.

Mr. CHARLES U. GEESEY, engineer of tests and metallurgist, U. S. Ordnance, during the war and formerly with the Gary Works of the U. S. Steel Corporation, has joined the executive force of the Garford Motor Truck Co., Lima, Ohio, as chief chemist, metallurgist and adviser to the heat-treatment department.

Mr. H. E. HARING, for the last two years in the inspection division of the Ordnance Department, is now connected with the Bureau of Standards, where he will be engaged in electrochemical research.

Dr. CHARLES L. PARSONS, chief chemist, has tendered his resignation from the Bureau of Mines, to become effective Nov. 1. On that date he will open an office in the Mills Building annex at Washington, D. C., where he will conduct the Washington office of the American Chemical Society and in addition will do private work.

Prof. J. W. RICHARDS, Lehigh University, South Bethlehem, has returned to the United States after spending the summer in Denmark, Norway and Sweden.

Dr. THEODORE W. RICHARDS, professor of chemistry at Harvard University, has been elected president of the American Academy of Arts and Sciences.

Mr. EDGAR S. ROSS, formerly chief chemist for the Charlotte Chemical Laboratories and Columbite Reduction Co. of Charlotte, N. C., is now located at New Hampshire College, Durham, N. H., where he will carry out special research in the rare earths in conjunction with Professor C. James.

Major General WILLIAM L. SIBERT, director of the Chemical Warfare Service, U. S. A., has been made a commander of the French Legion of Honor.

Prof. ALEXANDER SMITH, head of the department of chemistry at Columbia University, was granted on July 10 the honorary degree of doctor of laws by the University of Edinburgh.

Lt.-Col. C. G. STORM, Ordnance Department, U. S. A., chief of the Research Section, Ammunition Division, has been honorably discharged from the service and is now engaged in research work with the Pennsylvania Trojan Powder Co., Allentown, Pa.

Dr. J. P. STREET, chemist in charge of the analytical laboratory of the Connecticut Agricultural Experiment Station, and recently major in the Sanitary Corps of the U. S. Army, has been assigned by the National Canners' Association as chief inspector for the State of Indiana.

Current Market Reports

The Non-Ferrous Metal Market

Tuesday, Sept. 23.—Pending the restoration of normal conditions in the steel industry, little business is being transacted in the non-ferrous metal market.

Aluminum:—The market remains quiet, with 98-99 per cent ingots at 33c. per lb. There is a fair demand for scraps; cast, 21¼-24½c.; sheet, 21-23¼c.; clippings, 23¼-27¼c.

Antimony:—The market is quiet; spot wholesale lots being offered at 8¾c. and job lots at 8¾-8¼c.

Copper:—Reports indicate favorable prospects for a buying movement when the steel situation is relieved. Spot and September are quoted at 23½c. lb., October and November, 24c.

Copper sheets, hot-rolled	lb.	33.50 — .....
Copper sheets, cold rolled	lb.	35.00 — .....
Copper bottoms	lb.	41.50 — .....
Copper rods	lb.	24.75 — .....
Copper wire	lb.	26.00 — .....
High brass wire and sheets	lb.	27.75 — .....
High brass rods	lb.	26.75 — .....
Low brass wires and sheets	lb.	30.50 — .....
Low brass rods	lb.	31.25 — .....
Brazed brass tubing	lb.	39.00 — .....
Brazed bronze tubing	lb.	44.25 — .....
Seamless copper tubing	lb.	37.50 — .....
Seamless bronze tubing	lb.	44.25 — .....
Seamless brass tubing	lb.	36.00 — .....
Scrap, heavy machinery comp		17½ — 18½
Scrap, heavy and wire		17½ — 18½
Scrap, light and bottoms		15½ — 16½
Scrap, heavy, cut and crucible		19 — 20
Scrap brass, heavy		10¾ — 11½
Scrap brass, casting		12 — 12½
Scrap brass, light		9½ — 10½
Scrap, No. 1 clean brass turnings		10¾ — 10¾
Scrap, No. 1 comp. turnings		16½ — 16½

Lead:—The market is firm, spot New York being 6.07½-6.25c. and East St. Louis, 5.85-6c. lb.

Tin: London reports indicate a further decline. Straits spots are quoted on the New York market at 55c., with 99 per cent electrolytic at 54½c. lb.

Zinc:—The falling off of the demand from the steel companies caused a further drop in price. Spot New York, 7.30c. lb.; October, 7.35c.; November, 7.37½c.; December, 7.40c. East St. Louis spot, 7.00-7.05c.; October, 7.10c.; November, 7.15c.; December, 7.17½c.

OTHER METALS

Bismuth	lb.	$2.95 — .....
Cadmium	lb.	1.50 — $1.75
Cobalt	lb.	2.50 — 3.50
Magnesium	lb.	1.75 — 2.10
Mercury	75 lb.	105.00 — 108.00
Nickel	lb.	.41 — .45
Iridium	oz.	175.00 — .....
Palladium	oz.	115.00 — 120.00
Platinum	oz.	110.00 — 115.00
Silver	oz.	1.15½ — .....

The Iron and Steel Market

The iron and steel markets were more or less influenced during August and the fore part of September by threats of a strike in the industry. Since the strike began Monday, Sept. 22, there has been no distinct market situation, the strike being the sole item of interest.

The strike may be described from several different angles as follows:

(1) It is a strike of common labor almost wholly. Of the common labor the strikers are mainly the foreign born, as it was only to them in their ignorance that a strong appeal could be made by the agitators.

(2) It varies in intensity in districts, in the order of intensity approximately as follows: Wheeling, Youngstown, Calumet (Chicago and Gary), Lake Erie front, the Pittsburgh district, the South, the East. There is practically no strike east of Johnstown, Pa., and Buffalo, N. Y., while the Cambria and Lackawanna plants, respectively, at those points are closed completely.

(3) It affected the Steel Corporation and independents about equally, but as the East did not strike and is wholly independent, the remainder of the industry showed more strike for the independents than for the Steel Corporation.

(4) The strike being of common labor, it affected plants making various products in about the same proportion.

After a careful scrutiny of reports covering practically all points it may be estimated that the strike closed abou. 35 per cent of the productive capacity. The curtailment in output was greater than this, because in the matter of a strike it is not tonnage output that counts, but employment. As long as a plant is operating it counts against the strikers, because men are working in it, whether or not the output is in proportion to the number of men working.

On the whole, the strike was not altogether as extensive as the manufacturers expected, in case the strike call were persisted in at all. The strike order was issued Sept. 10, for Sept. 22, but in the interim there was almost continuous doubt as to whether or not the order would be recalled. It is not certain, however, that the strike disappointed the agitators, who, by their conduct beforehand, had given many inklings that they were doubtful of being able to produce a strike of any magnitude. That they would call a strike when such doubt existed is not strange, for they knew one thing quite well, that their chances of success were at the peak. They had produced a certain amount of excitement and unrest among the men and had no means of maintaining the excitement. This could be done only by an active force. The excitement did not tend to maintain itself, but would die out if not nurtured. It was a species of mob psychology, in which these labor agitators are fairly well versed or they would be unable to agitate.

Being of common labor, the strike affected blast-furnaces more than steel works, where the works were operated in conjunction, but by reason of so many merchant blast-furnaces being scattered, and largely free from strike on that account, there is more or less of an even break between the proportion of steel capacity and of blast-furnace capacity affected. In the Mahoning and Shenango valleys, where merchant furnaces are close together, there were few that did not have to bank.

The districts did much as was to be expected. The Wheeling district has always been strong for strikes, and some of the plants were closed by the managements in advance, it being fully realized that a strike would occur. Almost the entire district was idle the first day of the strike. Youngstown was closed practically tight within a day or so. Youngstown will be remembered as

the scene of riots early in January, 1916, so the district ran true to form.

The Connellsville coke region was not touched by the strike. The by-product plants at Youngstown were closed, but the Farrell plant remained in operation, and the great Clairton plant operated better than 50 per cent. With so many furnaces banked a surplus of coke developed and Connellsville operations had to run fewer days per week, with a possibility that some ovens would have to be put out entirely. The lake ore boats were able to leave with full crews, but it was not certain that the condition would continue.

As soon as the general scope of the strike could be gaged with some accuracy the conclusion was reached that the question whether the strike would grow or diminish would be determined by the Monongahela Valley. That valley did not escape altogether, the two independent steel plants at Monessen being closed at the outset and the Braddock and Rankin wire plants within a day or two. The three great Carnegie works, Homestead, Edgar Thomson and Duquesne, however, escaped almost entirely, except for a few blast-furnaces; Clairton operated in part, and the great National Tube Works at McKeesport escaped entirely. It was expected that if the Monongahela Valley could be kept in operation to the extent that obtained the first two days of the strike there would eventually be a yielding of the strikers at Youngstown and then a yielding even as far away as Gary and Chicago. At this writing the prospects are that the Monongahela Valley will hold. The agitators at once concentrated their efforts on Homestead, but without making any inroads beyond the slight defections that occurred at the outset.

The iron and steel manufacturers held no meetings in advance of the strike and needed none to become of one mind, for the issue was too plain to admit of doubt or debate. It was purely one of surrender of control of the plants to professional agitators. The manufacturers will contest the issue until they have won. How long or how short the contest will be no one has ventured to predict. Professional strike breakers will not be employed. Undoubtedly many of the men who are out are out because of intimidation and the number of such will doubtless grow. There have been numerous clashes between strikers and would-be workers, but the arrangements of State, county and municipal authorities have been extensive and are probably adequate for the preservation of order, though possibly not for the return of men to work, unless such men are very largely in the majority. The time may come when strenuous measures will be necessary to protect men desiring to return to work.

The organization campaign did not produce strike funds, as the small sums collected from those who "joined" would barely pay running expenses. Some of the 24 unions under whose auspices the movement was conducted may have large strike funds, but the money would not be used except to support members of the respective crafts, and thus such funds scarcely count at all. Many of the common laborers, and it is claimed the great majority, are relatively well provided with funds, running into hundreds of dollars apiece. The manufacturers are of course in position to conduct a strike indefinitely, as the time is long past for iron and steel manufacturers to be short term borrowers. The chief hardship, and a very great one, in a prolonged strike, would fall upon the consumers of steel. Many buyers of steel have been quick to advise the steel producers from whom they draw their supplies that they are in full accord with the manufacturers' position and will uncomplainingly submit to any hardships the situation imposes.

The Chemical Market

New York, September 22.

Business in this market, on the whole, is good; in some branches it is excellent. Belonging in the latter class are industrial chemicals and coal-tar intermediates. While the sagging condition of foreign exchange has had a deterrent effect on export trading, business of proportions yet emanates from that source. Fairly representative of conditions in the chemical field is the statement of an important manufacturer that last month was the biggest month he has had in two years, and that he is sold ahead for the next two months on practically all his products. As against the weakness in crude rubber and naval stores, the vegetable oil market is apparently becoming stronger, due to the fact that speculative interests are now buying to cover previous losses, while soap manufacturers have run low in supplies and are anxious buyers.

The influenza scare which is sweeping the country again is having the effect of bringing out very strong demands for *formaldehyde*, which is held at 22c. per lb. minimum. Leading makers are sold in advance four weeks to two months. There is also a sizable outlet through export channels.

There being a present slight shortage of *aqua ammonia*, with demand increased, a strengthening inclination is apparent, although no change in price has been announced.

Demand for *salt cake* (*sodium sulphate*) has not diminished since the last review. With several producers having their output for the remainder of the year taken, there is a slight shortage. One manufacturer has advanced the quotation to $21 per ton, but this increase is by no means general.

Unabated demand keeps the heavy acids, particularly *muriatic* (*hydrochloric*), in short supply. South America and Cuba have been buying heavily of these acids for some time, as well as *aluminum sulphate*. Lack of demand, on the other hand, has sent *tartaric acid* down to 79½c. per lb. from 84-86c. An export interest in *picric acid* has sprung up recently with the Far East and South America the principal buyers.

The majority of producers are allotting only small quantities of *barium chloride* to their customers, this being another of the chemicals whose production is covered—in some cases to the end of the year—by advance sales.

Similarly affected by the conditions of shortage and demand are *sodium nitrate*, *sodium prussiate*, *yellow*, both the red and yellow varieties of *potassium prussiate*, *alcohol* and *refined gum camphor*. On practically all of these items manufacturers are behind in deliveries. Gum camphor has received a sharp advance of 10c. per lb., to $3.30, with the bigger interests seemingly having dropped out of the market.

Manufacturers are still holding *sodium bichromate* at 15c. per lb., although now and then a few lots are offered at 14¼-14½c.

Coal-Tar Products

Some manufacturers of coal-tar intermediates, having their production for the remainder of the year already sold, are busying themselves with placing contracts for next year. Still the prominent feature of this market is aniline oil. It is very scarce at 32c. per lb. for spot, an advance of 2c. over the bottom selling figure two weeks ago. Future deliveries into next year are offered at 26c. Aniline salt is in the same strong position with spot material quoted at 35c. minimum, in comparison with 28c. which obtained at the last writing.

The Government restriction on the export of its surplus phenol, together with the cost entailed in re-working material purchased from this source, has led to an advance by manufacturers to 15-16c. in drums for the U. S. P. grade.

Metol, a photographic developer, is again on the market, selling at $11 per lb. It is another of the German-made products on which chemists have been experimenting during the war and which now can be produced in sufficient quantity for commercial use.

Vegetable Oils

Domestic business is holding most of the interest in vegetable oils, the bulk of the buying coming from speculative interests and soap manufacturers. Export commerce shows some improvement and is only awaiting exchange adjustments before accruing to former proportions. Germany and Austria are negotiating for large quantities of vegetable oils through indirect sources.

General Chemicals

WHOLESALE PRICES IN NEW YORK MARKET, SEPT. 23, 1919

		Carlots	Less Carlots
Acetic anhydride	lb.	.....	$0.55 – $0.60
Acetone	lb.	$0.13½ – $0.14	.15 – .15½
Acid, acetic, 28 per cent.	cwt.	2.50 – 3.00	3.00 – 3.25
Acetic, 56 per cent.	cwt.	5.00 – 5.50	6.00 – 6.50
Acetic, glacial, 99½ per cent. carboys	cwt.	12.00 – 12.50	12.90 – 13.50
Boric, crystals	lb.	.13 – .13½	.13½ – .14
Boric, powder	lb.	.13 – .13½	.13½ – .14
Hydrochloric, (muriatic) tech. 20 deg.	cwt.	1.50 – 1.75	2.00 – 2.50
Hydrofluoric, 52 deg.	lb.	.10 –	.11 – .....
Lactic, 44 per cent. tech.	lb.	.11 – .14	.12 – .16
Lactic, 22 per cent. tech.	lb.	.05 – .06	.05½ – .07
Molybdic, C. P.	lb.	..... –	4.00 – 4.25
Nitric, 40 deg.	lb.	.06 – .06½	.07 – .08½
Nitric, 42 deg.	lb.	.07 – .07½	.08 – .....
Oxalic, crystals	lb.	.23 – .25	.25 – .30
Phosphoric, Ortho, 50 per cent. solution	lb.	.09 –	.10 – .14
Picric	lb.	.30 – .35	.40 – .50
Pyrogallic, resublimed	lb.	..... –	2.30 – 2.55
Sulphuric, 60 deg., tank cars	ton	12.00 – 16.00	..... – .....
Sulphuric, 60 deg., drums	ton	17.00 –	22.00 – .....
Sulphuric, 60 deg., carboys	ton	20.00 –	25.00 – .....
Sulphuric, 66 deg., tank cars	ton	17.00 – 18.00	22.00 – 23.00
Sulphuric, 66 deg., drums	ton	20.00 – 21.00	25.00 – 26.00
Sulphuric, 66 deg., carboys	ton	25.00 –	30.00 – 40.00
Sulphuric, fuming, 20 per cent. (oleum) tank cars	ton	20.00 –	27.00 – .....
Sulphuric, fuming, 20 per cent. (oleum) drums	ton	25.00 –	32.00 – .....
Sulphuric, fuming, 20 per cent. (oleum) carboys	ton	30.00 –	35.00 – .....
Tannic, U. S. P.	lb.	..... –	1.35 – 1.45
Tannic (tech.)	lb.	..... –	.42 – .55
Tartaric, crystals	lb.	..... –	.79½ – .86
Tungstic, per lb. of WO	lb.	..... –	1.20 – 1.40
Alcohol, Ethyl	gal.	4.75 –	4.90 – .....
Alcohol, Methyl	gal.	1.30 –	1.33 – 1.38
Alcohol, denatured, 188 proof	gal.	.52 –	.54 – .55
Alcohol, denatured, 190 proof	gal.	.46 – .48	.50 – .51
Alum, ammonia lump	lb.	.03½ – .04½	.04½ – .04½
Alum, potash lump	lb.	.08 – .08½	.09 – .09½
Alum, chrome lump	lb.	.15 – .16	.18 – .20
Aluminum sulphate, commercial	lb.	.01½ – .02	.02½ – .02½
Aluminum sulphate, iron free	lb.	.02½ – .03	.03½ – .03½
Aqua ammonia, 26 deg., drums (750 lb.)	lb.	07 –	.08 – .08½
Ammonia, anhydrous, cylinders (100-150 lb.)	lb.	..... –	.30 – .35
Ammonium carbonate, powder	lb.	.13 – .13½	.14 – .14½
Ammonium chloride, granular (white salammoniac)	lb.	.12½ – .13	.13½ – .14
Ammonium chloride, granular (gray salammoniac)	lb.	.12 – .12½	.13 – .13½
Ammonium nitrate	lb.	.10 –	.11 – .12
Ammonium sulphate	lb.	.05 –	.06 – .....
Amyl acetate	gal.	..... –	3.75 – 4.00
Arsenic, oxide, lumps (white arsenic)	lb.	..... –	.09 – .09½
Arsenic, sulphide, powdered (red arsenic)	lb.	..... –	..... – .....
Barium chloride	ton	75.00 – 80.00	85.00 – 90.00
Barium dioxide (peroxide)	lb.	.22 –	.24 – .....
Barium nitrate	lb.	.10 – .10½	.11 – .12
Barium sulphate (precip.) (blanc fixe)	lb.	.02½ – .03	.03½ – .04
Bleaching powder (see calcium hypochlorite)	.....	..... –	..... – .....
Blue Vitriol (see copper sulphate)	.....	..... –	..... – .....
Borax (see sodium borate)	.....	..... –	..... – .....
Brimstone (see sulphur, roll)	.....	..... –	..... – .....
Bromine	lb.	..... –	.65 – .75
Calcium acetate	cwt.	2.00 – 2.05	2.10 – .....
Calcium carbide	lb.	..... –	.04 – .05
Calcium chloride, fused, lump	ton	19.00 – 25.00	30.00 – 40.00
Calcium chloride, granulated	lb.	.01½ – .01½	.02 – .02½
Calcium hypochlorite (bleaching powder)	cwt.	2.00 – 2.25	2.50 – .....
Calcium peroxide	lb.	..... –	1.50 – 1.70
Calcium phosphate, monobasic	lb.	..... –	.75 – .....
Calcium sulphate, precipitated	lb.	..... –	.09 – .09½
Carbon bisulphide	lb.	.05½ –	.06 – .....
Carbon tetrachloride, drums	lb.	.10 – .11	.12 – .14
Carbonyl chloride (phosgene)	lb.	..... –	.75 – .....
Caustic potash (see potassium hydroxide)	.....	..... –	..... – .....
Caustic soda (see sodium hydroxide)	.....	..... –	..... – .....
Chlorine, gas, liquid-cylinders (100 lb.)	lb.	.05 – .05½	.08 – .....
Cobalt oxide	lb.	..... –	1.00 – 1.65
Copperas (see iron sulphate)	.....	..... –	..... – .....
Copper carbonate, green precipitate	lb.	..... –	.28 – .31
Copper cyanide	lb.	..... –	.65 – .70
Copper sulphate, crystals	lb.	.08½ – .08½	.09 – .09½
Cream of tartar (see potassium bitartrate)	.....	..... –	..... – .....
Epsom salt (see magnesium sulphate)	.....	..... –	..... – .....
Formaldehyde, 40 per cent.	lb.	..... –	.20 – .22½
Glauber's salt (see sodium sulphate)	.....	..... –	..... – .....
Glycerine	lb.	..... –	.19 – .21
Iodine, resublimed	lb.	..... –	4.50 – .....
Iron oxide, red	lb.	..... –	.03 – .20
Iron sulphate, (copperas)	cwt.	1.00 –	1.20 – 1.50
Lead acetate, normal	lb.	..... –	.12½ – .14½
Lead arsenate (paste)	lb.	..... –	.13 – .17
Lead nitrate, crystals	lb.	..... –	.85 – .86½
Litharge	lb.	..... –	.09½ – .10½
Lithium Carbonate	lb.	..... –	1.50 – .....
Magnesium carbonate, technical	lb.	..... –	.13 – .14½
Magnesium sulphate, U. S. P.	100 lb.	2.00 – 2.63	2.75 – 3.00
Magnesium sulphate, commercial	100 lb.	1.75 –	2.00 – 2.50
Nickel salt, double	lb.	.14 –	.15 – .....
Nickel salt, single	lb.	.12 –	.15 – .16
Phosgene (see carbonyl chloride)	.....	..... –	..... – .....
Phosphorus, red	lb.	..... –	.60 – .70
Phosphorus, yellow	lb.	..... –	.35 – .37
Potassium bichromate	lb.	.25 – .28	.30 – .....
Potassium bitartrate (cream of Tartar)	lb.	..... –	.55 – .60
Potassium bromide, granular	lb.	..... –	.49 – .50
Potassium carbonate, U. S. P.	lb.	.60 –	.65 – .70
Potassium carbonate, crude	lb.	.19 –	.21 – .....
Potassium chlorate, crystals	lb.	.20 – .24	.25 – .30
Potassium cyanide, 98-99 per cent.	lb.	nominal	..... – .....
Potassium hydroxide (caustic potash)	lb.	.30 – .32	.35 – .40
Potassium iodide	lb.	..... –	3.55 – 3.60
Potassium nitrate	lb.	.19 –	.21 – .....
Potassium permanganate	lb.	..... –	.55 – .65
Potassium prussiate, red	lb.	..... –	1.05 – 1.15
Potassium prussiate, yellow	lb.	..... –	.50 – .60
Potassium sulphate	ton	225.00 –	..... – .....
Rochelle salts (see sodium potas. tartrate)	.....	..... –	..... – .....
Salammoniac (see ammonium chloride)	.....	..... –	..... – .....
Sal soda (see sodium carbonate)	.....	..... –	..... – .....
Salt cake (sodium sulphate)	ton	17.00 – 21.00	..... – .....
Silver cyanide	oz.	..... –	1.19 – .....
Silver nitrate	oz.	..... –	.69½ – .70½
Soda ash, light	100 lb.	1.90 – 2.00	2.10 – 2.25
Soda ash, dense	100 lb.	2.25 –	2.50 – 2.75
Sodium acetate	lb.	.05½ – .06½	.07 – .08
Sodium bicarbonate	100 lb.	2.35 –	2.75 – 3.00
Sodium bichromate	lb.	.14½ – .14½	.15 – .16
Sodium bisulphate (nitre cake)	ton	3.00 – 8.00	10.00 – .....
Sodium bisulphite	cwt.	1.80 – 1.90	2.00 – 2.10
Sodium borate (borax)	lb.	.07½ –	.08 – .08½
Sodium carbonate (sal soda)	100 lb.	1.35 – 1.50	1.50 – 1.75
Sodium chlorate	lb.	.15 –	.16 – .18½
Sodium cyanide	lb.	.30 –	.31 – .34
Sodium fluoride	lb.	.13 –	.14 – .15
Sodium hydroxide (caustic soda)	100 lb.	2.75 –	2.90 – 3.50
Sodium molybdate	lb.	2.50 –	3.25 – .....
Sodium nitrate	100 lb.	3.00 – 3.25	3.75 – 4.00
Sodium nitrite	lb.	.09½ – .10	.10½ – .13
Sodium peroxide, powdered	lb.	..... –	.30 – .32
Sodium phosphate, dibasic	lb.	.03½ – .04	.04½ – .05
Sodium potassium tartrate (Rochelle salts)	lb.	..... –	.43 – .45½
Sodium prussiate, yellow	lb.	.17½ – .18½	.19 – .20
Sodium silicate, solution (40 deg.)	lb.	.01½ – .02	.02 – .02½
Sodium silicate, solution (60 deg.)	lb.	.02½ – .03	.03½ – .04½
Sodium sulphate, crystals (Glauber's salts)	cwt.	1.05 – 1.35	1.50 – 2.00
Sodium sulphide, crystal, 60-62 per cent. (conc)	lb.	..... –	.05 – .06
Sodium sulphite, crystals	lb.	.03½ –	.04 – .06
Strontium nitrate, crystals	lb.	.25 –	.28 – .....
Sulphur chloride	lb.	.05½ –	.06 – .....
Sulphur, crude	ton	22.00 –	..... – .....
Sulphur dioxide, liquid, cylinders	lb.	..... –	.10 – .12
Sulphur (sublimed), flour	100 lb.	3.10 –	3.40 – 3.65
Sulphur, roll (brimstone)	100 lb.	2.95 –	3.15 – 3.40
Tin bichloride (stannous)	lb.	.44 –	.46 – .50
Tin oxide	lb.	..... –	.60 – .....
Zinc carbonate, precipitate	lb.	..... –	.20 – .....
Zinc chloride, gran.	lb.	.12½ –	.13½ – .14
Zinc cyanide	lb.	.49 –	.50 – .....
Zinc dust	lb.	.09 – .11	.11 – .14
Zinc oxide, dry American	lb.	..... –	.09 – .15
Zinc sulphate	lb.	.03½ – .03½	.04 – .04½

Coal-Tar Products

NOTE—The following prices are for original packages in large quantities:

Alpha naphthol, crude	lb.	$1.00	$1.10
Alpha naphthol, refined	lb.	1.40	1.50
Alpha naphthylamine	lb.	.32	.50
Aniline oil, drums extra	lb.	.32	.33
Aniline salts	lb.	.32	.35
Anthracine, 80% in drums (100 lb.)	lb.	.90	1.00
Benzaldehyde (f.f.c.)	lb.	1.00	1.15
Benzidine, base	lb.	1.00	1.25
Benzidine, sulphate	lb.	1.00	1.15
Benzoic acid, U. S. P.	lb.	.90	1.10
Benzoate of soda, U. S. P.	lb.	.85	1.10
Benzol, pure, water-white, in drums (100 lb.)	gal.	.25	.29
Benzol, 90%, in drums (100 lb.)	gal.	.24	.28
Benzyl chloride, 95-97%, refined	lb.	.35	.40
Benzyl chloride, tech.	lb.	.25	.35
Beta naphthol benzoate	lb.	3.75	4.50
Beta naphthol, sublimed	lb.	.75	.80
Beta naphthol, tech.	lb.	.45	.55
Beta naphthylamine, sublimed	lb.	2.25	2.35
Cresol, U. S. P., in drums (100 lb.)	lb.	.18	.....
Ortho-cresol, in drums (100 lb.)	lb.	.23	.25
Cresylic acid, 97-99%, straw color, in drums	gal.	.85	.90
Cresylic acid, 95-97%, dark, in drums	gal.	.80	.85
Cresylic acid, 50%, first quality, drums	gal.	.60	.....
Dichlorbenzol	lb.	.07	.10
Diethylaniline	lb.	1.40	2.25
Dimethylaniline	lb.	.55	.60
Dinitrobenzol	lb.	.26	.37
Dinitroclorbenzol	lb.	.25	.30
Dinitronaphthaline	lb.	.45	.55
Dinitrophenol	lb.	.33	.36
Dinitrotoluol	lb.	.38	.45
Dip oil, 25%, tar acids, car lots, in drums	gal.	.58	.65
Diphenylamine	lb.	.58	.75
H-acid	lb.	1.60	1.75
Metaphenylenediamine	lb.	1.15	1.80
Monochlorbenzol	lb.	.12	.15
Monoethylaniline	lb.	1.50	1.75
Naphthaline crushed, in bbls. (250 lb.)	lb.	.06	.08
Naphthaline, flake	lb.	.06½	.07½
Naphthaline, balls	lb.	.08½	.10
Naphthionic acid, crude	lb.	.75	1.25
Nitrobenzol	lb.	.14	.19
Nitro-naphthaline	lb.	.35	.45
Nitro-toluol	lb.	.17	.20
Ortho-amidophenol	lb.	3.75	4.25
Ortho-dichlor-benzol	lb.	.15	.20
Ortho-nitro-phenol	lb.	.90	1.25
Ortho-nitro-toluol	lb.	.25	.40
Ortho-toluidine	lb.	.30	.45
Para-amidophenol, base	lb.	2.60	3.50
Para-amidophenol, HCl	lb.	2.75	3.25
Para-dichlor-benzol	lb.	.15	.18
Paranitraniline	lb.	.95	1.10
Para-nitro-toluol	lb.	1.35	1.80
Paraphenylenediamine	lb.	2.50	4.00
Paratoluidine	lb.	1.50	2.50
Phthalic anhydride	lb.	1.50	2.15
Phenol, U. S. P., drums (dest.), (240 lb.)	lb.	.12	.15
Pyridin	gal.	2.50	.....
Resorcin, technical	lb.	3.50	3.75
Resorcin, pure	lb.	6.50	6.75
Salicylic acid, tech., in bbls. (110 lb.)	lb.	.35	.40
Salicylic acid, U. S. P.	lb.	.45	.48
Salol	lb.	.85	.95
Solvent naphtha, water-white, in drums, 100 gal.	gal.	.20	.27
Solvent naphtha, crude, heavy, in drums, 100 gal.	gal.	.18	.24
Sulphanilic acid, crude	lb.	.25	.30

Tolidine	lb.	$1.70	—	$2.50
Toluidine, mixed	lb.	.45	—	.55
Toluol, in tank cars	gal.	.26	—	.....
Toluol, in drums	gal.	.30	—	.....
Xylidine, drums, 100 gal.	lb.	.44	—	.50
Xylol, pure, in drums	gal.	.37	—	.45
Xylol, pure, in tank cars	gal.	.35	—	.....
Xylol, commercial, in drums, 100 gal.	gal.	.23	—	.27
Xylol, commercial, in tank cars	gal.	.22	—	.....

Waxes

Prices based on original packages in large quantities.

Beeswax, natural crude, yellow	lb.	$0.44	—	$0.45
Beeswax, refined, yellow	lb.	.48	—	.49
Beeswax, white pure	lb.	.65	—	.68
Carnauba, No. 1	lb.	.85	—	.88
Carnauba, No. 2, regular	lb.	.65	—	.80
Carnauba, No. 3, North Country	lb.	.50	—	.52
Japan	lb.	.18½	—	.19½
Paraffine waxes, crude match wax (white) 105-110 m.p.	lb.	.06	—	.....
Paraffine waxes, crude, scale 124-126 m.p.	lb.	.06	—	.06½
Paraffine waxes, refined, 118-120 m.p.	lb.	.07½	—	.08
Paraffine waxes, refined, 128-130 m.p.	lb.	.09	—	.09½
Paraffine waxes, refined, 133-135 m.p.	lb.	.11	—	.11½
Paraffine waxes, refined, 135-137 m.p.	lb.	.12½	—	.13½
Stearic acid, single pressed	lb.	.25	—	.26
Stearic acid, double pressed	lb.	.27	—	.28
Stearic acid, triple pressed	lb.	.30	—	.33

Flotation Oils

All prices are f.o.b. New York, unless otherwise stated, and are based on carload lots. The oils in 50-gal. bbls., gross weight, 500 lb.

Pine oil, steam dist., sp. gr., 0.930-0.940	gal.	$1.05		
Pine oil, pure, dest. dist.	gal.	.96		
Pine tar oil, ref., sp. gr. 1.025-1.035	gal.	.45		
Pine tar oil crude, sp.gr. 1.025-1.035 tank cars f.o.b. Jacksonville, Fla.	gal.	.33		
Pine tar oil, double ref., sp.gr. 0.965-0.990	gal.	.65		
Pine tar, ref., thin, sp. gr., 1.080-1.960	gal.	.34		
Turpentine, crude, sp. gr., 0.900-0.970	gal.	.85		
Hardwood oil, f.o.b. Mich., sp. gr., 0.960-0.990	gal.	.30		
Pinewood creosote, ref.	gal.	.48		

Naval Stores

The following prices are f.o.b., New York, for carload lots.

Rosin B-D, bbl.	280 lb.	$16.80	—	$18.25
Rosin E-I	280 lb.	18.50	—	20.75
Rosin K-N	280 lb.	21.00	—	24.00
Rosin W. G.-W. W.	280 lb.	24.50	—	25.25
Wood rosin, bbl.	280 lb	17.00	—	18.25
Spirits of turpentine	gal.	1.73	—	1.75
Wood turpentine, steam dist.	gal.	1.68	—	.....
Wood turpentine, dest. dist.	gal.	1.50	—	.....
Pine tar pitch, bbl.	200 lb.	8.25	—	8.50
Tar, kiln burned, bbl. (500 lb.)	bbl.	13.50	—	13.75
Retort tar, bbl.	280 lb.	14.25	—	14.75
Rosin oil, first run	gal.	.86	—	.91
Rosin oil, second run	gal.	.88	—	.93
Rosin oil, third run	gal.	.95	—	1.07
Rosin oil, fourth run	gal.	1.05	—	1.10

Solvents

73-76 deg., steel bbls. (85 lb.)	gal.	$0.33½		
70-72 deg., steel bbls. (85 lb.)	gal.	.31½		
68-70 deg., steel bbls. (85 lb.)	gal.	.30½		
V. M. and P. naphtha, steel bbls. (85 lb.)	gal.	.23½		

Crude Rubber

Para—Upriver fine	lb.	$0.54	—	.....
Upriver coarse	lb.	.32	—	.32½
Upriver caucho ball	lb.	.32	—	.....
Plantation—First latex crepe	lb.	.49	—	.50
Ribbed smoked sheets	lb.	.48	—	.49
Brown crepe, thin, clean	lb.	.45	—	.46
Amber crepe No. 1	lb.	.46	—	.47

Oils

VEGETABLE

Unless otherwise noted, the following prices are f.o.b., New York.

Castor oil, No. 3, in bbls.	lb.	$0.18½	—	$0.19
Castor oil, AA, in bbls.	lb.	.21	—	.22
China wood oil, in bbls.	lb.	.22½	—	.23
Cocoanut oil, Ceylon grade, in bbls.	lb.	.17½	—	.18½
Cocoanut oil, Cochin grade, in bbls.	lb.	.19½	—	.20
Corn oil, crude, in bbls.	lb.	.20	—	.25
Cottonseed oil, crude (f.o.b. mill)	lb.	.16	—	.20
Cottonseed oil, summer yellow	lb.	.23½	—	.26
Cottonseed oil, winter yellow	lb.	.24½	—	.27
Linseed oil, raw, car lots	gal.	2.08	—	2.12
Linseed oil, raw, tank cars	gal.	2.08	—	2.10
Linseed oil, boiled, car lots	gal.	2.00	—	2.14
Olive oil, commercial	gal.	2.30	—	2.50
Palm, Lagos	lb.	.17	—	.17½
Palm, bright red	lb.	.16½	—	.17½
Palm, Niger	lb.	.16	—	.17
Peanut oil, crude, tank cars (f.o.b. mill)	lb.	.19½	—	.22
Peanut oil, refined, in bbls.	lb.	.27	—	.28
Rapeseed oil, refined in bbls.	gal.	1.50	—	1.60
Rapeseed oil, blown, in bbls.	gal.	1.57	—	1.70
Soya bean oil (Manchurian), in bbls., N. Y.	lb.	.17	—	.18
Soya bean oil, tank cars, f.o.b., Pacific coast	lb.	.14	—	.15

FISH

Winter pressed Menhaden	gal.	$1.28	—	.....
Yellow bleached Menhaden	gal.	1.30	—	$1.31
White bleached Menhaden	gal.	1.32	—	.....
Blown Menhaden	gal.	1.34	—	1.38

Miscellaneous Materials

All Prices f.o.b., N. Y.

Barytes, domestic, white, floated	ton	$25.00	—	$36.00
Barytes, off color	ton	20.00	—	25.00
Blanc fixe, dry	lb.	.03½	—	.04½
Blanc fixe, pulp	ton	35.00	—	47.50
Casein	lb.	.16	—	.18
Chalk, English, extra light	lb.	.05	—	.07
Chalk, English, light	lb.	.04½	—	.06
Chalk, English, dense	lb.	$ .04	—	$ .05
China clay (Kaolin), imported, lump	ton	25.00	—	35.00
China clay (Kaolin), imported, powdered	ton	30.00	—	60.00
China clay (Kaolin), domestic, lump	ton	10.00	—	20.00
China clay (Kaolin), domestic, powdered	ton	25.00	—	40.00
Feldspar	ton	11.50	—	16.00
Fluorspar, acid grade, lump, f.o.b. mines	net ton	$30.00	—	$35.00
Fluorspar, acid grade, ground, f.o.b. mines	net ton	35.00	—	45.00
Fuller's earth, domestic, powdered	ton	30.00	—	40.00
Fuller's earth, imported, powdered	ton	.....	—	.....
Pumice stone, imported	lb.	.03	—	.06
Pumice stone, domestic	lb.	.02½	—	.....
Shellac, TN	lb.	1.10	—	1.15
Shellac, D. C.	lb.	.....	—	.....
Shellac, V. S. O.	lb.	.....	—	.....
Shellac, Diamond I.	lb.	.....	—	.....
Shellac, orange, fine	lb.	.....	—	.....
Shellac, orange, superfine	lb.	1.20	—	1.30
Shellac, A.C. garnet	lb.	.....	—	.....
Shellac, bleached, bone dry	lb.	1.30	—	.....
Shellac, bleached, fresh ground	lb.	1.20	—	.....
Soapstone	ton	15.00	—	25.00
Talc, domestic	ton	16.00	—	60.00
Talc, imported	ton	55.00	—	60.00

Refractories

Following prices are f.o.b. works:

Chrome brick	net ton	80-90	at Chester, Penn.
Chrome cement	net ton	45-50	at Chester, Penn.
Clay brick, 1st quality fireclay	net ton	35-45	at Clearfield, Penn.
Clay brick, 2nd quality	net ton	30-35	at Clearfield, Penn.
Magnesite, dead burned	net ton	50-55	at Chester, Penn.
Magnesite brick, 9 x 4½ x 2½ in.	net ton	80-90	at Chester, Penn.
Silica brick	net ton	41-45	at Mt. Union, Penn.

Ferro-alloys

All prices f.o.b. works.

Ferro-carbon-titanium, 15-18%, f.o.b. Niagara Falls, N. Y.	net ton	$200.00	—	$250.00
Ferro-chrome, per lb. of Cr. contained, 6-8% carbon	lb.	.30	—	.40
Ferro-chrome, per lb. of Cr. contained, 2-4% carbon	lb.	.70	—	.....
Ferro-manganese, 70-80% Mn	gross ton	105.00	—	115.00
Spiegeleisen, 16-20% Mn	gross ton	35.00	—	36.00
Ferro-molydenum, per lb. of Mo	lb.	2.50	—	3.00
Ferro-silicon, 50%	gross ton	85.00	—	95.00
Ferro-silicon, 75%	gross ton	150.00	—	175.00
Ferro-silicon, 10-15%	gross ton	45.00	—	60.00
Ferro-tungsten, 70-80%, per lb. of contained W.	lb.	1.25	—	1.40
Ferro-uranium, 35-50%, of U	lb.	7.00	—	.....
Ferro-vanadium, 30-40% per lb. of contained V.	lb.	5.50	—	7.00

Ores and Semi-finished Products

Chrome ore, 35-40%, Cr_2O_3	unit	$0.60	—	$0.80
Chrome ore, 48% and over	unit	.90	—	1.00
Coke, foundry, f.o.b. ovens	net ton	5.50	—	6.00
Coke, furnace, f.o.b. ovens	net ton	4.00	—	5.00
Petroleum coke, refinery, Atlantic seaboard	net ton	12.00	—	12.50
Fluorspar, gravel, f.o.b. mines	net ton	20.00	—	25.00
Manganese ore, 45% Mn and over	unit	.50	—	.75
Manganese ore, chemical (MnO_2)	gross ton	60.00	—	70.00
Molybdenite, 85% MoS_2, per lb. of MoS_2	lb.	.75	—	.85
Tungsten, Scheelite, 60% WO_3 and over, per unit of WO_3	unit	9.00	—	15.00
Tungsten, Wolframite, 60% WO_3 and over, per unit of WO_3	unit	7.50	—	10.00
Uranium oxide, 96%	lb.	.....	—	.....
Vanadium pentoxide, 99%	lb.	6.00	—	.....
Pyrites, foreign, lump	unit	.13	—	.....
Pyrites, foreign, fine	unit	.13	—	.....
Pyrites, domestic, fine	unit	.14	—	.17½
Ilmenite, 52% TiO_2, f.o.b. N. Y.	net ton	40.00	—	.....
Rutile, 95% TiO_2, f.o.b. N. Y.	net ton	200.00	—	.....
Carnotite, minimum 2% U_3O_8, per lb. of U_3O_8	lb.	2.75	—	3.00
Zircon, washed, iron free, f.o.b. N. Y.	net ton	135.00	—	.....
Monazite, per unit of ThO_2, f.o.b. N. Y.	unit	42.00	—	.....

Plant Materials and Supplies

In carload lots, New York, unless otherwise stated.

BUILDING MATERIALS

Portland cement, at dock, without bags	bbl.		$2.30
Lump lime, common, including container	300 bbl.		2.65
Common brick, at dock	M.		15.00
Yellow pine, 3x4 to 8x8, 20 ft. and under	M.		48.00
Yellow pine, 3x4 to 8x8, 20 ft. and under at Chicago	M.		55.00
Yellow pine, 3x4 to 8x8, 20 ft. and under at St. Louis	M.		49.00
Roofings, tar felt (14 lb. per 100 sq.ft.)	ton	60.00–	70.00
Roofings, tar pitch (in 400-lb. bbl.) carlots	ton		21.00
Roofings, asphalt pitch carlots	ton		34.00
Roofings, asphalt felt carlots	ton		63.00
Roofings, slate-surfaced, per roll of 108 sq.ft. carlots			2.25
Roofings, slate-finished shingles, 100 sq.ft. carlots			6.00
Linseed oil, raw in barrels	gal.		2.15
Linseed oil, 5 gal. cans	gal.		2.30
Red lead, dry, 100 lb. keg	lb.		.13
Red lead, in oil, 100 lb. keg	lb.		.14½
Red lead, dry, 5 lb. cans	lb.		.15
Red lead, in oil, 5 lb. cans	lb.		.16½
White lead, dry and in oil, 100 lb. keg	lb.		.13
White lead, dry and in oil, 25 and 50 lb. kegs	lb.		.13½
White lead, dry and in oil, 5 lb. cans	lb.		.15

STRUCTURAL STEEL, MILL, PITTSBURGH

Beams and channels, 3 to 15-in.	100 lb.	$2.45
Angles, 3 to 6-in., ¼-in. thick	100 lb.	2.45
Tees, 3-in. and larger	100 lb.	2.45
Plates	100 lb.	2.66
Rivets, structural, ½-in. and larger	100 lb.	4.20
Rivets, conehead for boilers, ½-in. and larger	100 lb.	4.30
Sheets, No. 28 black	100 lb.	4.35
Sheets, No. 10 blue annealed	100 lb.	3.55
Sheets, No. 28 galvanized	100 lb.	5.70

For painted corrugated sheets, add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gage; for galvanized corrugated sheets, add 15c., all gages.